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JANUARY 1986

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INSIDE:

- Refining Graphic Animation
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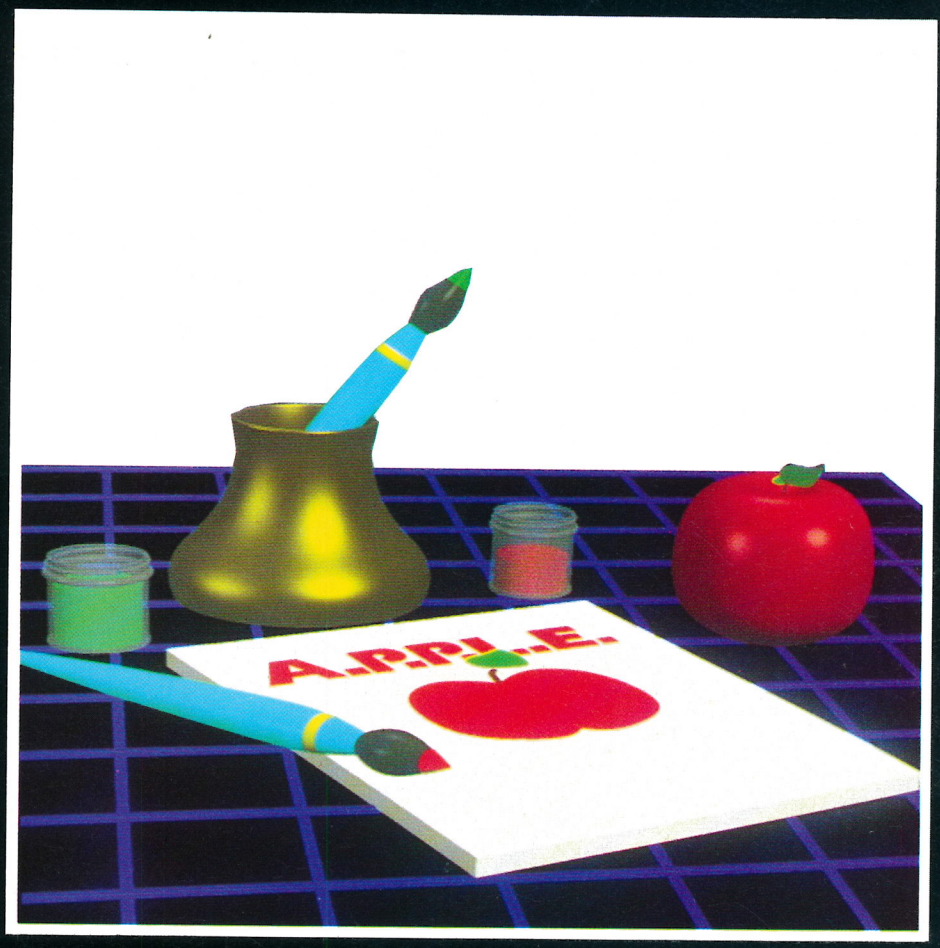
- ProDOS MLI & Assembler Macros



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- "Blankenship BASIC"

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- Accessing DOS 3.3 Disks from Pascal
- Handling Applesoft Errors
- Technical Solutions, New Products, and more...

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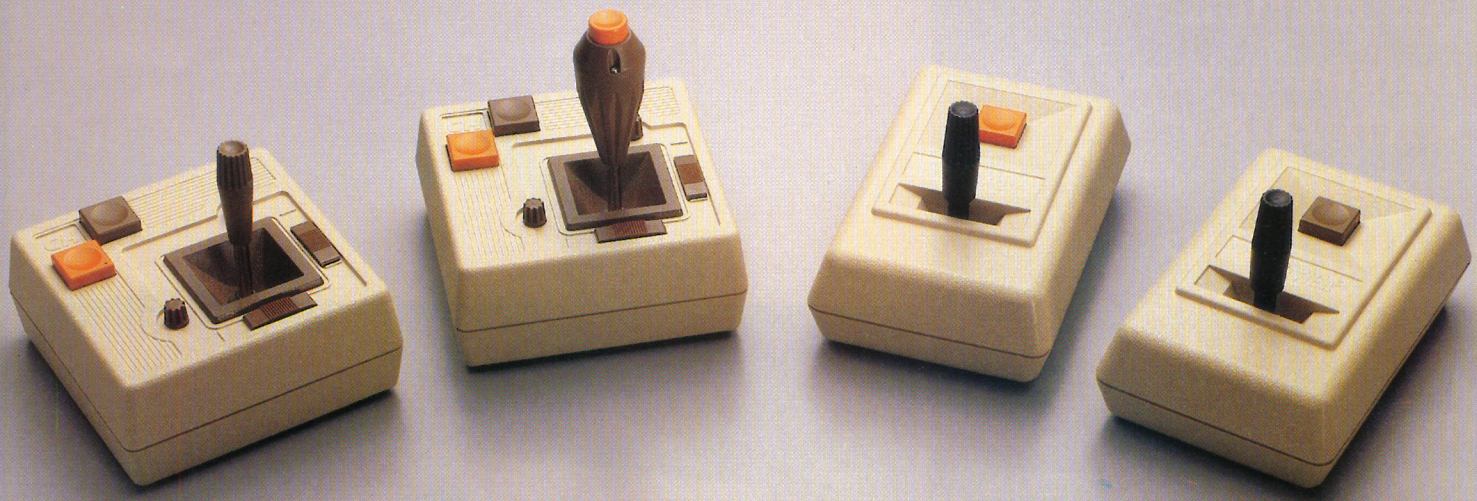

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Bring the power of structured, compiled BASIC to your Apple

Release Your Computer's Hidden Potential

IF you've been programming in BASIC on the Apple II+, IIe, or IIc then you haven't realized the full potential of your computer yet. Now, thanks to *Micol Basic*, you can turn your Apple into a high-speed structured programming machine.

Micol Basic, the next logical step after Applesoft, is perhaps the most sophisticated programming language ever developed for the Apple II. For the first time you have the capabilities you never thought possible. Discover how easy it can now be to write superior programs that run faster. And it's so easy to learn, too, since it's based on a language you already know. . . Applesoft.

Much More Than an Applesoft Compiler

Micol Basic is capable of compiling your existing Applesoft programs, significantly increasing their execution speed. But make no mistake, far more than an Applesoft compiler, it contains features usually found only in the highly structured programming languages such as Pascal or C. Now you can have many of these features on your Apple without the difficulty of having to learn a totally new programming language.

Makes Applesoft Obsolete

Write programs that anyone can easily understand. Long variable names, indentation, structured loop control, improved file handling and a host of other abilities will make the maintenance of your programs a breeze. Now you can write those GOTOless programs that Applesoft never allowed you to do.

Fast Compiling and Linking

Micol Basic is written in assembly language, the fastest possible code on your computer. There is little time lost compiling or linking, giving you more time to do what you do best . . . program.

Effortless Editing

Micol Basic's powerful text editor makes editing your programs a real pleasure. No longer will you require an ESCAPE and right arrow sequence to do the simplest tasks. You now have edit with auto character insertion, search, replace, add, auto line number and much more to assist you.

Price Breakthrough

Based upon current prices of software on the Apple II, you could easily expect to pay $200 for a product of this quality and utility. Few people are willing to pay that much for software, regardless of how good or unique it is. Our introductory price is only $49.95, a price almost unheard of for a product of this significance, a price any Apple II owner can easily afford.

Engineered For People Who Truly Love Programming

But speed, structure and affordability are still not enough. A language system must not only provide you with these necessary features, it must also be convenient to use if your time spent in programming is to be truly enjoyable. And *Micol Basic* is easy to use, being engineered to the highest man-machine standards available. It does most of the busy work, leaving you free to do what the computer cannot do . . . think.

Superior Documentation

Poorly written documentation is a major complaint of many computer programmers. Our documentation will be a pleasant surprise. In its over 200 pages, you'll find not only an easy to understand description of the software, but also a complete tutorial on structured programming.

Here is a partial list of additional features that can allow you to create the best BASIC programs possible:

- Fully copyable disk
- Very compact, fast 6502 machine code generated
- Speed of execution several times that of equivalent Applesoft programs
- More structured loop capabilities than virtually any other programming language
- IF/THEN/ELSE/ENDIF
- Block structuring
- True integer, or mixed integer/real arithmetic
- Fast integer FOR loops
- Variable names of any length
- Boolean variables
- Dynamic strings
- Multidimensional arrays
- Complete implementation of Applesoft graphics
- Additional commands such as MOD, INDEX, DELAY and more
- Advanced file handling capabilities
- Complete support for either 40 or 80 column operation
- Operates under fast, versatile ProDOS
- Superb debugging facilities
- Compiled listings to screen or printer
- Complete diagnostic information during and after compilation
- Visible code generation if desired
- Easy interface with machine language programs
- Allows maximum memory for user's programs
- Chaining
- Error handling facilities
- No licensing fee for commercially written software required
- All utilities tailor-written for the Apple II in 100% machine code

ATTENTION EDUCATORS: Now you have the ideal tools for teaching programming on the Apple II; Applesoft in ROM for the beginning students and *Micol Basic* on disk for your more advanced students.

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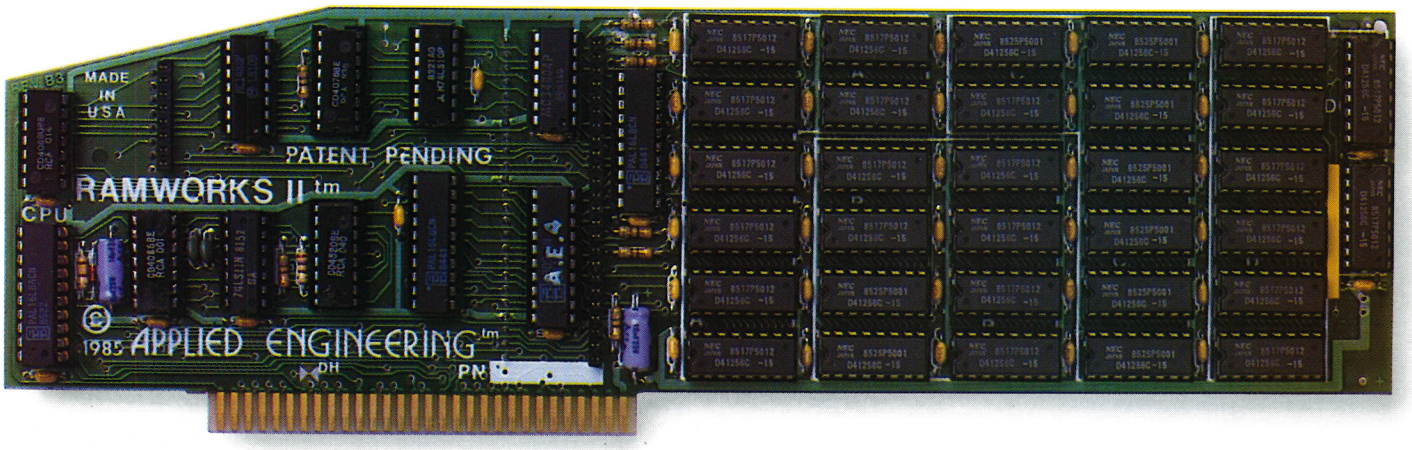


RamWorks II. A Generation Ahead. Again.

The best selling expansion card for the Apple IIe just got even better. With RamWorks II, expand your IIe to an incredible 3 megabytes of usable RAM.

Turbo Charged AppleWorks.

RamWorks II plugs into the IIe auxiliary slot and acts just like Apple's extended 80 column card, only better—because if you buy a 256K or larger card, AppleWorks will automatically load itself into RamWorks II. This dramatically increases AppleWorks' speed and power because it effectively eliminates the time required to access disk drive 1. Now, switch from word processing to spreadsheet to database management at the speed of light. AppleWorks responds the moment your fingers touch the keyboard.

But AppleWorks has certain internal limits, independent of available memory. Fear not. Only RamWorks II (and the original RamWorks of course) removes those limits. Only RamWorks II increases the maximum number of records available from 1,350 to over 16 000. Only RamWorks II actually increases the number of lines permitted in the word processing mode. And only RamWorks II features a built-in printer buffer, so you no longer have to wait for your printer to stop before going back to AppleWorks (256K or larger RamWorks II required).

With RamWorks II, you won't have to split your data into 2 or more separate files because you'll have the necessary memory to access ALL your data ALL the time, quickly and conveniently.

RamWorks II	AppleWorks Desktop
128K	101K
256K	188K
512K	378K
1 MEG	758K
1.5 MEG	1136K
3 MEG	2277K

The Most Friendly, Most Expandable Card Available.

RamWorks II is compatible with more off-the-shelf software than any other RAM card. Popular programs like Advanced VisiCalc, Magic Office System, Flashcalc, The Spread Sheet, Diversi-DOS, Supercalc 3A, Magicalc, etc. (and hardware add-ons like Profile and Sider hard disks). Fact is, only RamWorks is 100% compatible with all software written for the Apple 80 column and extended 80 column cards. In addition, RamWorks II can emulate most other RAM cards, so you can use programs written for them without modification. And any size RamWorks II can be user upgraded later to any larger size.

RamWorks II was designed so you could take full advantage of future developments in 16 and 32 bit microprocessors. As your needs grow, so can RamWorks II. A handy coprocessor connector allows the latest and greatest coprocessor cards to access all 3 MEG

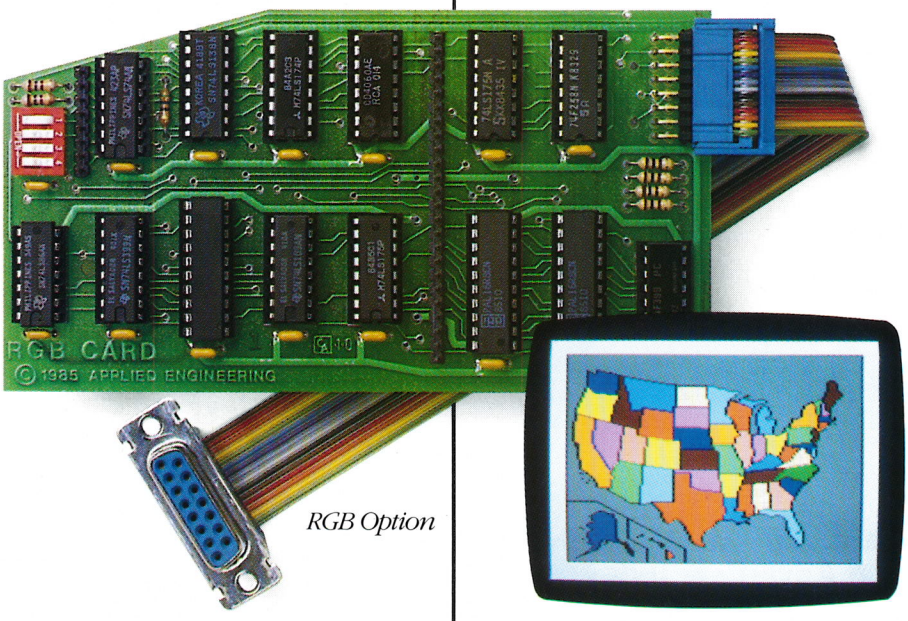
Circle 3 on Reader Service Card

of RamWorks II memory. And speaking of more memory, RamWorks II has a memory expansion connector on board so a low profile (no slot 1 interference) memory expansion card can add another 512K or 2 MEG of memory.

Unlike Apple's smaller, more expensive RAM card, RamWorks II plugs into the IIe auxiliary slot and therefore leaves slots 4 and 5 available for other peripheral cards.

It's In Color

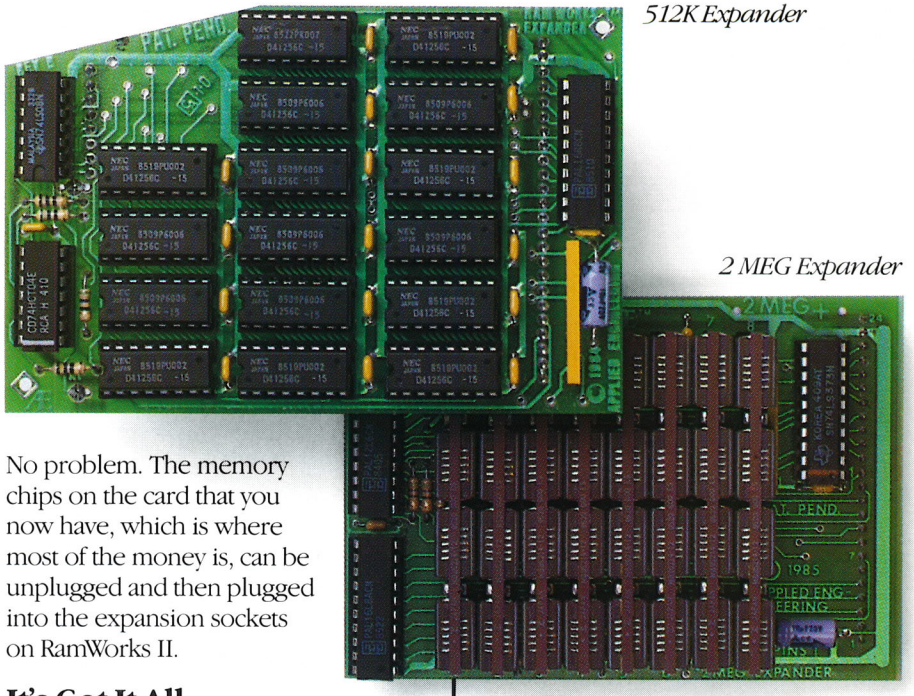
RamWorks II by itself is *fully* compatible with both the Apple monochrome and color monitors. But if you want better color graphics *plus* a more readable 80 column text (that blows away any composite color monitor) you'll appreciate our RGB color option. For only $129, it can be added to RamWorks II, giving you a razor sharp, vivid brilliance that's unsurpassed in the industry. The RGB option does not waste another valuable slot, but rather plugs into the back of RamWorks II with no slot 1 interference (works on the original RamWorks, too) and attaches to virtually any RGB monitor. And remember. You can order the RGB option with your RamWorks II. Or add it on at a later date.



RGB Option

It Corrects Mistakes.

Let's say you bought some other RAM card (and that's a mistake) and your RAM card is not being recognized by AppleWorks, Advanced Visicalc, Flashcalc, Supercalc 3A, or other programs, and you want RamWorks II.



512K Expander

2 MEG Expander

No problem. The memory chips on the card that you now have, which is where most of the money is, can be unplugged and then plugged into the expansion sockets on RamWorks II.

It's Got It All.

- 15 Day Money Back Guarantee
- Super sharp 80 column text (patent pending) with or without RGB option
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- Expandable up to 1 Meg (1024K) on main board
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Official Publication of **A.P.P.L.E. Co-op** "People Helping People with Personal Technology"

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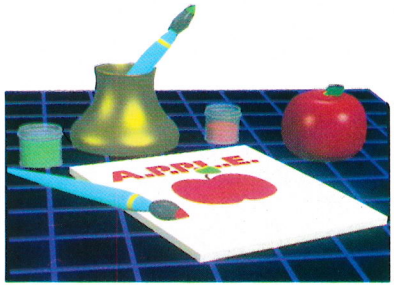

About the Cover

Given some basic tools, an artist can make an infinite variety of creations. As suggested by this computer-generated image, A.P.P.L.E. Co-op can help you fill your Apple's blank slate with a picture to suit your own interests.

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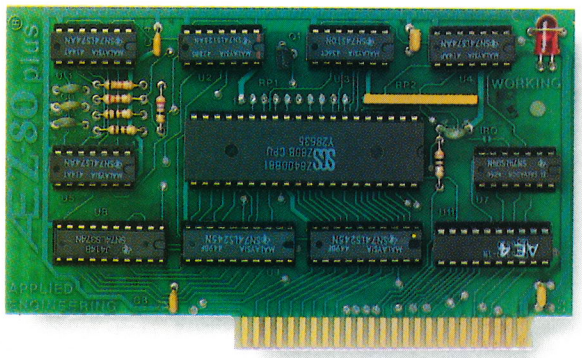

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Call-A.P.P.L.E. (ISSN 8755-4909) is published monthly by Apple PugetSound Program Library Exchange, 290 S.W. 43rd Street, Renton, Washington 98055, (206) 251-5222. Basic subscription price is $21 per year. Membership in A.P.P.L.E. Co-op, which includes magazine subscription, is $26 per year plus a one-time application fee. Additonal postage is required for First Class or foreign delivery.

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The INNER CIRCUIT

Don Elman

A Fresh Canvas

Turn on your computer and what do you get? Unless you've placed an auto-booting disk in the slot, chances are you'll find a blank screen staring at you with a deceptive tranquility interrupted only by that aptly-named, blinking cursor.

As an experienced computer user, you can appreciate that behind this apparently simple face is the potential for processing, organizing, and storing information in an infinite variety of ways. Just as an artist approaches a clean slate, or a writer considers a blank sheet of paper, the programmer and application user can utilize the available tools of the trade to create a personalized representation of whatever he or she wants to express. The microcomputer, in fact, is one of the most "general" purpose tools ever invented, threatening to overshadow the artist's brush and canvas, the writer's pen or typewriter, and even the accountant's ledger pad. The amazing speed and accuracy with which a computer can operate has meaning only when directed toward the existing needs and interests of people.

In This Issue

Like powering up a computer, the beginning of a new year offers the opportunity for a fresh start–preserving continuity with the best features of the past while opening up potential new directions. For you electronic artists, we continue with Part 7 of Randi Rost's **The Graphics Toolkit** as it unlocks more secrets of screen animation. Ken Kashmarek embarks on a new series called **ProDOS MLI and Assembler Macros**, while Christopher Howerton tells us about **Accessing DOS 3.3 Disks from Pascal**. In a more practical vein, we highlight **THE Spreadsheet as Illuminator** by John Geddis, and a hardware application for **A Lab Instrument Interface** by David Gregg and Daniel Macero. We also examine variations on Applesoft with Stein Goering's positive review of "**Blankenship BASIC**." Along with our usual columns and departments, we hope this combination of old and new will provide a solid start for your Apple computing in 1986.

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from Street Electronics

Apple II+,IIe

The BusinessCard™ is the most innovative multi-function card we have seen in years for the II+'s and IIe's. Included on the Business Card are two Apple Super Serial compatible serial interfaces, a ProDOS compatible clock/calendar with 5 year battery, built-in HIRES and double (128K IIe only) HIRES graphics screen printing capabilities, and optional printer buffering to 64K. Graphics and text can be printed by Apple, Epson, Okidata and other serial printers. HIRES and double HIRES printing is in color on the ImageWriter II™ and Scribe™ printers. HIRES graphic screen printing commands include: windowing, magnify, rotate, and inverse to name a few. Commands are provided to set margins, line and page length, page titles, page numbers and more. A nice slot-saver feature allows the clock functions to run out of slot 1 without interfering with printer functions. Software is provided to update your ProDOS disks to use the clock this way. If you have the extra slot, you may use the clock as a Thunderclock™ compatible in slot 5 or 7.

The business card can operate a serial printer, modem, keep track of the time and the date, as well as print graphics and text to a wide variety of printers. Functions may be accessed using Super Serial card control key sequences. You may prefer to use the BusinessCard's easily remembered plain English command set. Owners of 128K IIe's have one more method in addition: a complete mouse or keyboard driven Macintosh style pulldown menu system for selecting printer options and setting the clock. The BusinessCard gives you ease of use and a richness of features at a great price.

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Apple IIc

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Apple II,II+,IIe

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The AlphaBits II firmware features HIRES graphic screen-printing commands such as windowing, zoom (magnification), double HIRES screen dump, rotate, inverse and more. It will print graphics to the ImageWriter™, ImageWriter II™ color printer, Scribe™, Epson, Okidata, and other popular serial printers without software. Text formatting commands include margins, line and page length, page titles, and page numbers.

The AlphaBits II can also be used as a modem interface compatible with 300 or 1200 baud modems. This modem interface has commands identical to the SuperSerial Card with switch selectable baud rates. AlphaBits II is the single function equivalent of The BusinessCard™, sharing many of the same features including plain English commands, and for the IIe, pull-down menus.

(SPECIAL INTRODUCTORY PRICE $80.00 THROUGH 3/1/85)

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AlphaBits/BusinessCard CABLES

The AlphaBits and BusinessCards come with 5 pin female Din connectors for mounting at the back of your computer. You may use any Apple IIc compatible cable or order the following:

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Corrections to Fall/Winter Catalog

The Suggested Retail price for the REPEATERRR page 21, product code HRPT, should read $39.95. This includes the shift key modification kit.

The product code for SSD Pascal 1.2 Driver page 8 is incorrect. It should read SPASZ.

The product code for the A.P.P.L.E. 512K MAC UPGRADE KIT page 22 is incorrect. It should read HMCUPG.

The product code for MOUSE MATe II page 27 is incorrect. It should read HMSMAT.

The product code for THINK TANK page 28 is incorrect. It should read STHKAP.

All PDS disks, page 14, product code SPDS, are $5.00 or $25.00 for 10.

• Catalog Corrections

JANUARY 1986 NEW PRODUCTS

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MEMBER BILLBOARD

JANUARY 1986

Good News For Macintosh Owners

We have received a lot of letters concerning the Member Billboard last month about the change of content of *Call-A.P.P.L.E.* to an exclusive Apple Two journal and the expansion of our newsletter *32 little apples* to a full magazine. It seems the information about the expansion of *32 little apples* was not very clear. First an explanation of the thoughts behind the changes. A.P.P.L.E. Co-op membership is about 85% Apple Two owners and 15% Macintosh owners. The "reader's choice card" returns show about the same cluster analysis of the favored articles, about 85% of you like the Apple Two articles and about 15% of you the Mac articles. Very few of you rated a combination of articles as the most favored. Your letters show a similar theme. Two owners want more articles about their machine and Mac owners want more articles about their machine. There also does not seem to be much commonality between the two groups. So why not have two publications to better serve both groups? That's what we are going to do!

Now the clarification about *32 little apples*. It has been the Mac SIG group newsletter about to start its third year of publication. The last issue was 32 pages of articles and information exclusively on Mac. Beginning in February of 86, it will be a monthly publication, and the name will be changed to *Mac A.P.P.L.E.!* It is an issue you will not want to miss. Mac owners can receive it **free as a substitute** for *Call-A.P.P.L.E.* by simply sending in the postage paid form on the dust cover of this magazine. Members who wish to receive both magazines are offered a special rate of $1.00 per issue of *Mac A.P.P.L.E.* for the remainder of their paid membership. Check the appropriate box on the dust cover form and include the required funds. Your club is responding to your wishes and will be providing you with the quality publications you expect.

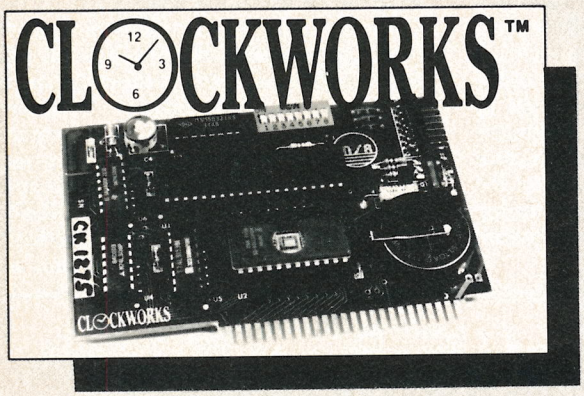
Other Notes of News

Apple Computer has **announced** the filling of the **User Group Evangelist** position. Her name is Ellen Petry Leanse. Her goal is to develop a program within Apple Computer to support User Groups. This is the first positive sign of recommendations presented to Apple Computer by fourteen User groups in a meeting in Cupertino last September. Dick Hubert represented the Co-op members at the meeting, and is encouraged by this announcement. We look forward to working with Ellen. The **New** Apple Computer is starting to do things right. Amen.

Chosen Readers

Sending in those Reader's Choice cards has paid off for three midwestern members at the drawings held in recent monthly meetings. Congratulations to Norman L. Joajoco of Batesville, Indiana, J. Nemchak of Ypsilanti, Michigan, and Ed Wicinski of Mt. Prospect, Illinois, who each have won a $100 credit toward A.P.P.L.E. Co-op products.

CLOCKWORKS™



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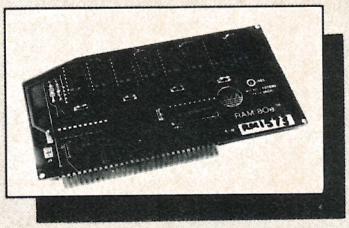

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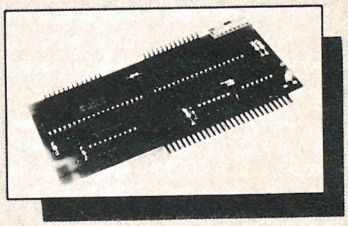

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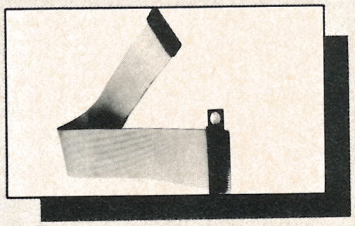

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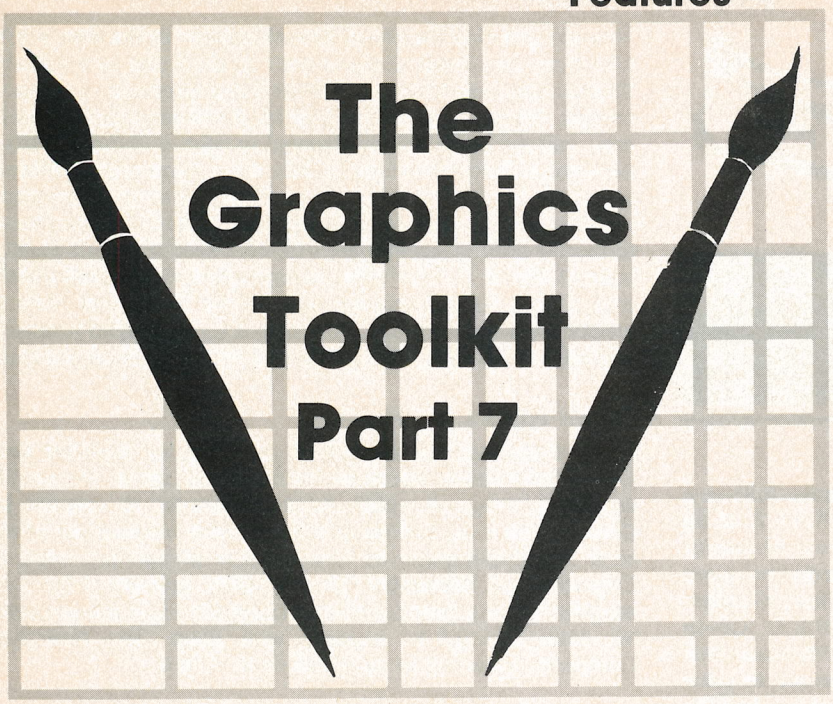
Circle 32 on Reader Service Card



The Graphics Toolkit Part 7

Randi J. Rost

LAST time we developed a routine to display block shapes on the hi-res graphics screen. Due to space considerations, we left out a very important part of that routine—clipping the shape to the graphics window boundaries. Our routine could handle only shapes entirely within the graphics window. This month we'll extend the DRAW routine to display shapes that are only partially within the graphics window.

Clipping

Clipping, or the act of discarding all parts of an object outside a given boundary, is a fundamental problem in computer graphics. Several algorithms have been developed to clip lines to two-dimensional and three-dimensional rectangular boundaries. Algorithms have also been developed to clip arbitrary polygons to a rectangular boundary.

Our application makes use of a rectangular viewing area which we have called the graphics window. The graphics window is set by making calls to CHGUPLFT and CHGLOWRT. Now we'd like to be able to draw rectangular shapes in such a way that only the area within the graphics window is affected. Thus we need to clip rectangles against our rectangular boundary. In the following discussion, the location of the rectangular shape to be drawn is assumed to be the (x,y) pair at the shape's upper left corner. This point will be referred to as the position of the shape, and its position will be noted by X and Y.

The most simplistic algorithm we can conceive operates as follows. First, check the y-coordinate of each line of the shape before it is drawn. If the y-coordinate is above the top of the graphics window or below the bottom of the window, skip the row entirely and go on to the next. Then, for each row not skipped, transfer only those pixels for which the x-coordinate is greater than or equal to the left edge of the window and less than or equal to the right edge.

Some improvements on the algorithm should be immediately obvious. First of all, the shape could be immediately rejected if it is found that Y is below the bottom of the window, since the entire shape must lie below the window. Similarly, if X is to the right of the right edge of the window, or if X + WIDTH is left of the left edge of the window, or if Y + HEIGHT is above the top of the window, the shape can be rejected immediately.

In addition, simple arithmetic can be used to determine the first row or column of the shape that is visible. Just subtract the window boundary coordinate from X or Y. For example, to compute how many rows to skip for a shape at 10,10 when WINDOWTOP = 15, compute 15 - 10. This indicates that five rows of shape data should be skipped before starting.

These are some of the ideas we'll include in our rectangle-clipping algorithm. To save code space, the trivial reject cases won't be implemented. The philosophy for this is that the user should take advantage of the speed of the graphics routines and not be wasting time drawing a lot of shapes that are off the screen. In other words, the trivial reject cases are left to the user. They can be done empirically, by not calling the shape draw routines with shapes that are completely outside the graphics window, or they can be done by calling the shape draw routines and letting them go through a little extra work to see that the shape is totally outside the graphics window.

The Algorithm

Once again, a fairly straightforward algorithm will become quite clouded after taking into consideration the 6502 8-bit arithmetic and Apple graphics memory organization. For this reason, we will first describe the algorithm to draw partially visible shapes from a high level, then look at its implementation line by line.

By the time it is determined that a shape is only partly visible, the DRAW routine will have computed a pointer to the beginning of the data for the shape that is to be drawn. The first step of our algorithm is to compute the pointer to the start of data for the correct frame of the specified shape. This is done in the same fashion as it is done for DRAW. One complication is added by the fact that X may be negative and some extra steps are

Listing 1

```
                        1   *
                        2   *  DRAWPART IS A SUBROUTINE THAT IS CALLED BY DRAW OR
                        3   *  XDRAW TO DRAW SHAPES THAT ARE ONLY PARTIALLY WITHIN
                        4   *  THE GRAPHICS WINDOW.  ALL PARTS OF THE SHAPE OUTSIDE
                        5   *  THE WINDOW ARE CLIPPED, WHAT REMAINS IS DRAWN.
                        6   *
                        7           ORG  $C68
                        8   XLOCLO  EQU  $06
                        9   XLOCHI  EQU  $07
                        10  YLOC    EQU  $08
                        11  HGADRLO EQU  $1E
                        12  HGADRHI EQU  $1F
                        13  HGRPG   EQU  $E6
                        14  YTABL   EQU  $EC
                        15  YTABH   EQU  $EE
                        16  SHPBASL EQU  $FC
                        17  SHPBASH EQU  $FD
                        18  FRMBASL EQU  $D4
                        19  FRMBASH EQU  $D5
                        20  XDIVTBL EQU  $4C
                        21  XMODTBL EQU  $D0
                        22  TEMPPTR2 EQU $D2
                        23  HEIGHT  EQU  $B00
                        24  WIDTH   EQU  $B01
                        25  DTEMPX  EQU  $B02
                        26  DTEMPY  EQU  $B03
                        27  BOTTOMY EQU  $B04
                        28  LFTXBYTE EQU $A68
                        29  RTXBYTE EQU  $A69
                        30  WNDWTOP EQU  $A6A
                        31  WNDWBOT EQU  $A6B
0C68: A5 08             32  DRAWPART LDA  YLOC      ;COMPUTE BOTTOM COORD
```

Continued

```
0C6A: 18        33          CLC             ;OF SHAPE TO BE DRAWN
0C6B: 6D 00 0B  34          ADC  HEIGHT
0C6E: 8D 04 0B  35          STA  BOTTOMY
0C71: A5 06     36          LDA  XLOCLO     ;DIVIDE X BY 2 TO GET HORIZ.
0C73: 4A        37          LSR             ;  RESOLUTION IN RANGE 0-139
0C74: 8D B6 0D  38          STA  TXLO
0C77: A4 07     39          LDY  XLOCHI
0C79: F0 17     40          BEQ  GITXMOD    ;IF XHI=0, WE'RE READY FOR LOOKUP
0C7B: C0 FF     41          CPY  #$FF       ;IF XHI=-1, BRANCH TO NEGX
0C7D: F0 0A     42          BEQ  NEGX
0C7F: AD B6 0D  43          LDA  TXLO       ;XHI = 1, SO ADJUST TXLO
0C82: 69 02     44          ADC  #$02       ;  BY TWO TO GET PROPER INDEX
0C84: 8D B6 0D  45          STA  TXLO       ;  FOR LOOKUP TABLE
0C87: D0 09     46          BNE  GITXMOD
0C89: 18        47  NEGX    CLC             ;XHI = -1 SO ADJUST TXLO
0C8A: AD B6 0D  48          LDA  TXLO       ;  BY FIVE TO GET PROPER INDEX
0C8D: 69 05     49          ADC  #$05       ;  INTO LOOKUP TABLE
0C8F: 8D B6 0D  50          STA  TXLO
0C92: AC B6 0D  51  GITXMOD LDY  TXLO
0C95: B1 D0     52          LDA  (XMODTBL),Y ;LOAD X MOD VALUE FROM TABLE
0C97: 0A        53          ASL             ;MULTIPLY BY 2 TO GET PROPER
0C98: A8        54          TAY             ;  OFFSET TO DESIRED FRAME
0C99: 18        56          CLC
0C9A: 71 FC     57          ADC  (SHPBASL),Y ;GET PROPER OFFSET TO ACTUAL
0C9C: 85 D4     58          STA  FRMBASL    ;FRAME DATA
0C9E: C8        59          INY
0C9F: B1 FC     60          LDA  (SHPBASL),Y
0CA1: 65 FD     61          ADC  SHPBASH    ;COMPUTE HI PART OF FRAME OFFSET
0CA3: 85 D5     62          STA  FRMBASH
0CA5: 18        63          CLC
0CA6: A5 FC     64          LDA  SHPBASL    ;ADD OFFSET TO SHAPE TABLE
0CA8: 65 D4     65          ADC  FRMBASL    ;  PTR TO GET PTR TO FRAME DATA
0CAA: 85 D4     66          STA  FRMBASL
0CAC: A9 00     67          LDA  #$00       ;COMPUTE HI PART OF PTR
0CAE: 65 D5     68          ADC  FRMBASH    ;  TO ACTUAL FRAME DATA
0CB0: 85 D5     69          STA  FRMBASH
0CB2: AD 00 0B  70          LDA  HEIGHT
0CB5: 8D B5 0D  71          STA  TEMPCNT    ;TEMPCNT WILL BE # ROWS ONSCREEN
0CB8: A4 08     72          LDY  YLOC       ;CHECK TO SEE IF -64 < Y < 0
0CBA: C0 C0     73          CPY  #$C0       ;VALUES>$C0 INDICATE NEGATIVE Y'S
0CBC: B0 05     74          BGE  SKIPROW    ;IF Y < 0, MUST SKIP SOME ROWS
0CBE: CC 6A 0A  75          CPY  WNDWTOP    ;IF Y < WNDWTOP, MUST SKIP ROWS
0CC1: B0 20     76          BGE  SYOK       ;OTHERWISE, IT'S COOL
0CC3: AD 00 0B  77  SKIPROW LDA  HEIGHT     ;KEEP TRACK OR ROWS REMAINING
0CC6: 8D B5 0D  78          STA  TEMPCNT    ;  IN SHAPE IN TEMPCNT
0CC9: AD 01 0B  79  SKIPLOOP LDA  WIDTH     ;LOAD WIDTH OF SHAPE
0CCC: 18        80          CLC
0CCD: 65 D4     81          ADC  FRMBASL    ;ADD WIDTH TO SHAPE FRAME
0CCF: 85 D4     82          STA  FRMBASL    ;  TO "SKIP" ONE ROW OF SHAPE DATA
0CD1: 90 02     83          BCC  SLT256A
0CD3: E6 D5     84          INC  FRMBASH
0CD5: CE B5 0D  85  SLT256A DEC  TEMPCNT    ;DECREMENT REMAINING ROWS
0CD8: D0 03     86          BNE  SCNT
0CDA: 4C B4 0D  87          JMP  SDONE      ;SHAPE IS TOTALLY ABOVE WINDOW
0CDD: C8        88  SCNT    INY
0CDE: CC 6A 0A  89          CPY  WNDWTOP    ;DOES Y = WNDWTOP YET?
0CE1: D0 E6     90          BNE  SKIPLOOP   ;IF NO, CONTINUE SKIPPING
0CE3: CC 6B 0A  91  SYOK    CPY  WNDWBOT    ;SEE IF Y > WNDWBOT
0CE6: 90 05     92          BLT  SYMORE
0CE8: F0 03     93          BEQ  SYMORE
0CEA: 4C B4 0D  94          JMP  SDONE      ;IF Y > WNDWBOT, WE'RE DONE
0CED: AD 01 0B  95  SYMORE  LDA  WIDTH
0CF0: 8D B5 0D  96          STA  TEMPCNT    ;INIT COUNTER FOR ONE ROW
0CF3: A5 07     97          LDA  XLOCHI
0CF5: C9 FF     98          CMP  #$FF       ;IS X < 0?
0CF7: D0 3C     99          BNE  SXNOTNEG   ;IF NOT, SKIP
0CF9: 8C 03 0B  100         STY  DTEMPY     ;OTHERWISE, STORE Y VALUE
0CFC: A5 06     101         LDA  XLOCLO     ;GET ABSOLUTE VALUE OF X
0CFE: 49 FF     102         EOR  #$FF       ;  BY USING ABS(X) = EOR(X) + 1
0D00: A8        103         TAY
0D01: C8        104         INY
0D02: B1 4C     105         LDA  (XDIVTBL),Y ;USE XDIVTBL TO SEE HOW MANY
0D04: 18        106         CLC             ;  BYTES ARE OFFSCREEN LEFT
0D05: 69 02     107         ADC  #$02       ;ROUND NUMBER OF BYTES TO
0D07: 4A        108         LSR             ;  NEXT GREATEST EVEN NUMBER
0D08: 0A        109         ASL
0D09: 8D 02 0B  111         STA  DTEMPX     ;RESULT IS BYTES TO SKIP FOR ROW
0D0C: CD 01 0B  112         CMP  WIDTH      ;COMPUTE MIN(WIDTH, DTEMPX)
0D0F: 90 03     113         BLT  SCONT
0D11: AD 01 0B  114         LDA  WIDTH
0D14: 18        115 SCONT   CLC             ;OTHERWISE, SKIP ENTIRE
0D15: 65 D4     116         ADC  FRMBASL    ;  ROW AND UPDATE FRAME DATA
0D17: 85 D4     117         STA  FRMBASL    ;  PTR ACCORDINGLY
0D19: 90 02     118         BCC  SNOINC1
0D1B: E6 D5     119         INC  FRMBASH
0D1D: AD 02 0B  120 SNOINC1 LDA  DTEMPX
0D20: CD B5 0D  121         CMP  TEMPCNT    ;IS SHAPE TOTALLY OFFSCREEN LEFT?
0D23: 90 03     122         BLT  SCONT1     ;IF NOT, SKIP TO DRAW PARTIAL ROW
0D25: 4C A8 0D  123         JMP  SNEXTY     ;JUMP TO NEXT ROW
0D28: 38        124 SCONT1  SEC             ;SUBTRACT NUMBER OF OFFSCREEN
0D29: AD B5 0D  125         LDA  TEMPCNT    ;  BYTES FROM NUMBER OF BYTES
0D2C: ED 02 0B  126         SBC  DTEMPX     ;  IN ROW OF SHAPE
0D2F: 8D B5 0D  127         STA  TEMPCNT
0D32: 4C 4C 0D  128         JMP  SXCONT     ;DONE WITH CASE WHERE X < 0
0D35: A5 4C     129 SXNOTNEG LDA  XDIVTBL   ;IF X > 0, GET START BYTE
0D37: 85 D2     130         STA  TEMPPTR2   ;  FROM XDIVTBL
0D39: A5 4D     131         LDA  XDIVTBL+1
```

needed to calculate which frame to use in such a case.

Once the pointer to the actual shape data has been computed, we'll check to see if Y is above the top of the graphics window. If it is, we'll determine how many rows of shape data are above the window and skip past MIN(HEIGHT * WIDTH, (WINDOWTOP - Y) * WIDTH) bytes of shape data. If Y is not above the top of the graphics window, we'll just start at the beginning of the shape data.

At this point, our current y is equal to WINDOWTOP. Now for each row, perform the following steps:

1. See if current y is greater than WINDOWBOTTOM.
2. If it is, go to end since we are done drawing shape.
3. Otherwise,
   - 3a. current x = X
   - 3b. Skip past all shape table data bytes (if any) for which current x is less than left of window
   - 3c. Draw all bytes of data (if any) for which current x is less than or equal to right of window
   - 3d. Skip all bytes of shape data (if any) for which current x is greater than right of window
   - 3e. Increment current y
   - 3f. If there is more shape data, goto step 1

Again, this algorithm will be somewhat slower in cases where a shape is entirely outside the window, but we've decided to leave it up to the programmer to make sure it doesn't happen very often.

Implementation

The routine shown in Listing 1 is the embodiment of the algorithm described above. For best results, include this routine in the same file as the DRAW routine presented in Part 6. Just skip over all the EQUs and DS's that are common to both routines and add the DRAWPART routine onto the end of the DRAW routine. After all, it is an integral part of the DRAW routine.

DRAWPART begins by computing the y value of the bottom row of the shape in lines 32-35. This value is stored in BOTTOMY for later use. Next, the routine finishes calculating the pointer to the actual shape frame data to be drawn. Lines 32-69 accomplish this in a manner nearly identical to lines 150-186 of the DRAW routine.

Lines 70-76 check to see if we need to skip any entire rows of data because of y values less than 0 or y values above the top of the graphics window. Lines 77-90 contain a loop that skips past these rows if necessary. When finished with the loop, if there is no more shape data to be read, we are done (lines 85-87).

When we've reached line 91, the Y register contains the y value of the first potentially visible row of the shape, and FRMBASL and FRMBASH point to the

first potentially visible byte of shape data. Lines 91-189 form a big loop that processes all remaining rows of the shape to be drawn.

The first step (lines 91-94) is to see whether the current y value is below the bottom of the window. If it is, we are done. Lines 95 and 96 set up the counter we'll use in our loop for all the bytes in the current row. Lines 97-128 handle skipping past all bytes in the row for which X is less than zero.

In lines 129-140, the first byte in the row to be (potentially) modified is computed using the XDIVTBL. When we reach SXCONT (line 141) the A register contains the number of the first byte in the row that may be overwritten with shape data, and TEMPCNT contains the number of bytes of data remaining for this row of the shape. (When TEMPCNT reaches 0, we're done with the row, no matter what we're doing.)

Lines 142-151 read past all shape data bytes for which the current x is less than the left edge of the window. Lines 152-176 form the loop for drawing any remaining visible bytes of the shape. Lines 177-182 read past any shape data bytes for which current x is greater than the right edge of the window. Lines 183-187 increment the row number and jump back to process any remaining rows of shape data.

Reader Exercises

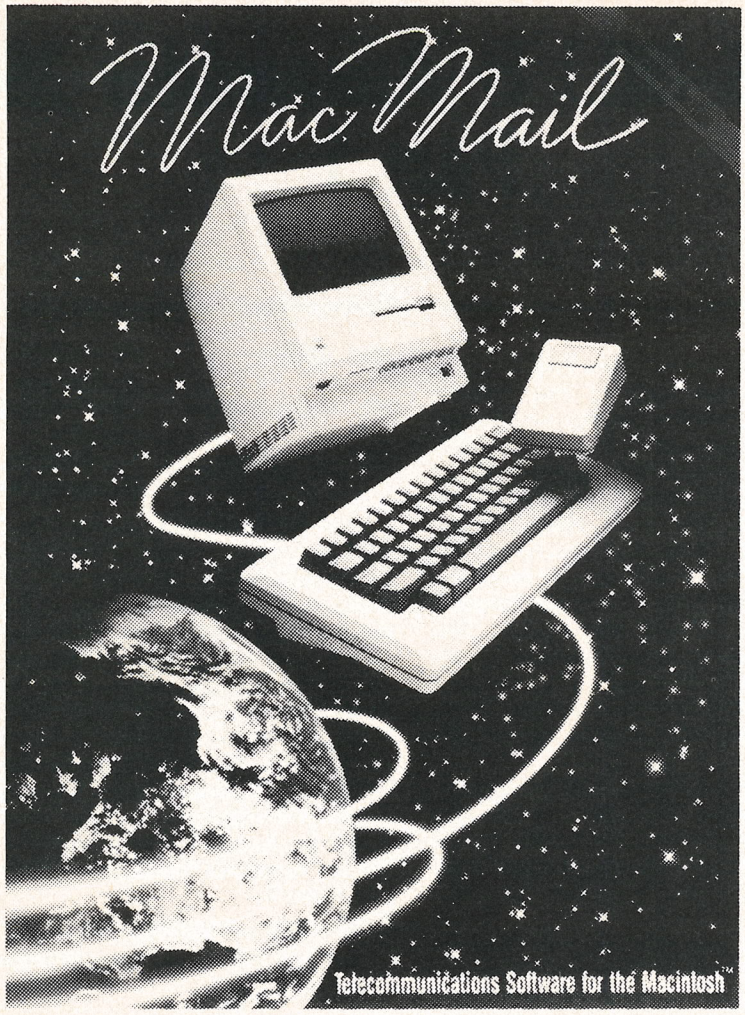
I've provided no demo programs this month, since we have merely enhanced the DRAW routine. You should experiment some more with the demo program presented last time and make sure that the block shape clipping works as advertised.

Try animating your object keeping Y constant and varying X from -32 ($FFE0) to 320 ($0140). Then try keeping X constant and varying Y from -16 ($F0) to 191 ($BF). Finally, experiment with CHGUPLFT and CHGLOWRT to set different graphics windows. Use HLINE to outline the defined window. Keep in mind that the boundaries of the graphics window will be on byte boundaries. Use DRAW and XDRAW to animate objects within the graphics window and clip them when necessary.

You now have most of what you need to design your own animation applications. There are many potential places for improvements in the routines I've presented, particularly in these last two installments. Depending on your needs, you can write similar routines that run faster for special cases or handle an even more general class of shapes or take up less space. Or you can leave the routines as they are and begin to develop some meaningful graphics applications.

There is still more ground to be covered. Next time we'll look at an application program that demonstrates the smoothest animation possible on the Apple II. Later on in the series, we'll talk about another useful type of shape. After that, who knows? You'll just have to stick around to find out!

```
0D3B: 85 D3      132           STA  TEMPPTR2+1 ;A POINTER TO THE XDIVTBL IS
0D3D: A5 07      133           LDA  XLOCHI     ;  STORED IN TEMPPTR2
0D3F: F0 02      134           BEQ  SLT256D    ;  IF X > 255, ADD 1 TO
0D41: E6 D3      135           INC  TEMPPTR2+1 ;  HI PART OF PTR SO WE GET
0D43: 8C 03 0B   136 SLT256D   STY  DTEMPY     ;  TO CORRECT XDIV VALUE
0D46: A4 06      137           LDY  XLOCLO     ;NOW THAT PTR IS ESTABLISHED,
0D48: B1 D2      138           LDA  (TEMPPTR2),Y ;  GET VALUE FOR X/7
0D4A: 4A         139           LSR             ;MAKE SURE WE START ON AN EVEN
0D4B: 0A         140           ASL             ;  BYTE BY TAKING BYTE/2*2
0D4C: 8D B7 0D   141 SXCONT    STA  TMPXBYTE   ;STORE STARTING BYTE FOR TRANSFER
0D4F: AD B7 0D   142 SXCOMP    LDA  TMPXBYTE   ;SKIP PAST DATA TILL X>=WNDWLFT
0D52: CD 68 0A   143           CMP  LFTXBYTE   ;IS X >= WNDWLFT?
0D55: B0 10      144           BGE  SXCONT2    ;IF YES, GO DRAW ROW
0D57: E6 D4      145           INC  FRMBASL    ;OTHERWISE, WE MUST SKIP
0D59: D0 02      146           BNE  SLT256E    ;  PAST MORE SHAPE DATA
0D5B: E6 D5      147           INC  FRMBASH
0D5D: CE B5 0D   148 SLT256E   DEC  TEMPCNT    ;DECREMENT # BYTES LEFT IN ROW
0D60: F0 46      149           BEQ  SNEXTY     ;IF CNT=0, DONE WITH THIS ROW
0D62: EE B7 0D   150           INC  TMPXBYTE   ;ELSE BRANCH BACK
0D65: D0 E8      151           BNE  SXCOMP     ;  TO SKIP MORE BYTES OF THIS ROW
0D67: AD B7 0D   152 SXCONT2   LDA  TMPXBYTE
0D6A: CD 69 0A   153           CMP  RTXBYTE    ;IS X <= WNDWRT?
0D6D: F0 02      154           BEQ  SXCONT3    ;IF SO, BEGIN DRAWING SHAPE
0D6F: B0 2B      155           BGE  SXCONT4    ;IF X > WNDWRT, DONE WITH ROW
0D71: AC 03 0B   156 SXCONT3   LDY  DTEMPY     ;SHAPE BYTE IS WITHIN
0D74: B1 EC      157           LDA  (YTABL),Y  ;SCREEN WINDOW, SO
0D76: 18         158           CLC             ;CALCULATE PROPER SCREEN ADDRESS
0D77: 6D B7 0D   159           ADC  TMPXBYTE
0D7A: 85 1E      160           STA  HGADRLO
0D7C: A9 00      161           LDA  #$00
0D7E: 71 EE      162           ADC  (YTABH),Y
0D80: 05 E6      164           ORA  HGRPG      ;GET CORRECT HGR PAGE
0D82: 85 1F      165           STA  HGADRHI    ;NOW HAVE ADDRESS OF SCREEN BYTE
0D84: A0 00      166           LDY  #$00
0D86: A2 00      167           LDX  #$00
0D88: A1 D4      168           LDA  (FRMBASL,X) ;GET SHAPE BYTE
0D8A: 51 1E      169 DEORLOC2  EOR  (HGADRLO),Y ;EOR WITH WHAT'S ON SCREEN
0D8C: 91 1E      170           STA  (HGADRLO),Y ;STORE IT ON SCREEN
0D8E: E6 D4      171           INC  FRMBASL    ;INCREMENT PTR TO SHAPE DATA
0D90: D0 02      172           BNE  SLT256F
0D92: E6 D5      173           INC  FRMBASH
0D94: EE B7 0D   174 SLT256F   INC  TMPXBYTE
0D97: CE B5 0D   175           DEC  TEMPCNT
0D9A: D0 CB      176           BNE  SXCONT2    ;BRANCH BACK FOR REST OF ROW
0D9C: 18         177 SXCONT4   CLC             ;NO MORE VISIBLE BYTES ON THIS ROW
0D9D: AD B5 0D   178           LDA  TEMPCNT    ;SKIP OVER REMAINING
0DA0: 65 D4      179           ADC  FRMBASL    ;SHAPE DATA FOR THIS ROW
0DA2: 85 D4      180           STA  FRMBASL    ;SINCE RIGHT EDGE OF WINDOW
0DA4: 90 02      181           BCC  SNEXTY     ;HAS BEEN REACHED
0DA6: E6 D5      182           INC  FRMBASH
0DA8: AC 03 0B   183 SNEXTY    LDY  DTEMPY
0DAB: C8         184           INY             ;INCREMENT ROW COUNTER
0DAC: CC 04 0B   185           CPY  BOTTOMY
0DAF: B0 03      186           BGE  SDONE
0DB1: 4C E3 0C   187           JMP  SYOK       ;AND DRAW REMAINING ROWS
0DB4: 60         188 SDONE     RTS
                 189 TEMPCNT   DS   1
                 190 TXLO      DS   1
                 191 TMPXBYTE  DS   1

--End assembly, 336 bytes, Errors: 0

Symbol table - alphabetical order:

  BOTTOMY =$0B04   ?  DEORLOC2=$0D8A   ?  DRAWPART=$0C68      DTEMPX  =$0B02
  DTEMPY  =$0B03      FRMBASH =$D5        FRMBASL =$D4        GITXMOD =$0C92
  HEIGHT  =$0B00      HGADRHI =$1F        HGADRLO =$1E        HGRPG   =$E6
  LFTXBYTE=$0A68      NEGX    =$0C89      RTXBYTE =$0A69      SCNT    =$0CDD
  SCONT   =$0D14      SCONT1  =$0D28      SDONE   =$0DB4      SHPBASH =$FD
  SHPBASL =$FC        SKIPLOOP=$0CC9      SKIPROW =$0CC3      SLT256A =$0CD5
  SLT256D =$0D43      SLT256E =$0D5D      SLT256F =$0D94      SNEXTY  =$0DA8
  SNOINC1 =$0D1D      SXCOMP  =$0D4F      SXCONT  =$0D4C      SXCONT2 =$0D67
  SXCONT3 =$0D71      SXCONT4 =$0D9C      SXNOTNEG=$0D35      SYMORE  =$0CED
  SYOK    =$0CE3      TEMPCNT =$0DB5      TEMPPTR2=$D2        TMPXBYTE=$0DB7
  TXLO    =$0DB6      WIDTH   =$0B01      WNDWBOT =$0A6B      WNDWTOP =$0A6A
  XDIVTBL =$4C        XLOCHI  =$07        XLOCLO  =$06        XMODTBL =$D0
  YLOC    =$08        YTABH   =$EE        YTABL   =$EC

Symbol table - numerical order:

  XLOCLO  =$06        XLOCHI  =$07        YLOC    =$08        HGADRLO =$1E
  HGADRHI =$1F        XDIVTBL =$4C        XMODTBL =$D0        TEMPPTR2=$D2
  FRMBASL =$D4        FRMBASH =$D5        HGRPG   =$E6        YTABL   =$EC
  YTABH   =$EE        SHPBASL =$FC        SHPBASH =$FD        LFTXBYTE=$0A68

  RTXBYTE =$0A69      WNDWTOP =$0A6A      WNDWBOT =$0A6B      HEIGHT  =$0B00
  WIDTH   =$0B01      DTEMPX  =$0B02      DTEMPY  =$0B03      BOTTOMY =$0B04
?  DRAWPART=$0C68    NEGX    =$0C89      GITXMOD =$0C92      SKIPROW =$0CC3
  SKIPLOOP=$0CC9      SLT256A =$0CD5      SCNT    =$0CDD      SYOK    =$0CE3
  SYMORE  =$0CED      SCONT   =$0D14      SNOINC1 =$0D1D      SCONT1  =$0D28
  SXNOTNEG=$0D35      SLT256D =$0D43      SXCONT  =$0D4C      SXCOMP  =$0D4F
  SLT256E =$0D5D      SXCONT2 =$0D67      SXCONT3 =$0D71   ?  DEORLOC2=$0D8A
  SLT256F =$0D94      SXCONT4 =$0D9C      SNEXTY  =$0DA8      SDONE   =$0DB4
  TEMPCNT =$0DB5      TXLO    =$0DB6      TMPXBYTE=$0DB7
```



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ProDOS MLI & Assembler Macros Part 1

Ken Kashmarek

FOR Apple II users, ProDOS offers a new world of data handling capabilities through the Machine Language Interface (MLI). Unlike the DOS 3.3 File Manager calls, the ProDOS MLI is a defined interface, is well documented, and much easier to use. However, for those of us who are not experts in assembly language, we could certainly use some help. There is a technique to access the MLI with relative ease. That technique uses assembly language macros to generate the MLI calls. Once the MLI macros are developed, we can then concentrate on application program function and logic.

With this installment of MLI & Macros, we will introduce MLI calls, control blocks, and use macros to generate the code. Future parts will extend the concepts and make greater use of macro facilites and MLI features.

Program examples will only illustrate MLI calls and macros. You can then provide code to input pathnames and other operands (menus, messages, and displayed output). We will be concentrating on the use of macros for the MLI and will not be concerned with writing the smallest or fastest programs. In fact, you will discover that using macros is one way to generate a lot of code very fast. Code optimization can be performed after program function is fully defined and program logic is correct. Macros will be built using Merlin Pro (generally compatible with the Big Mac assembler).

The Heart Of ProDOS

ProDOS applications, like BASIC.SYSTEM, are built around the MLI call. The Applesoft interface to ProDOS is an application that makes extensive use of the MLI to provide file capabilities. For space considerations, BASIC.SYSTEM uses compact and tightly coded subroutines to call the MLI. Our sample programs will concentrate on direct use of MLI functions and not worry about space. There are 26 MLI calls (see Table 1). We will be using the file handling calls ($C0-$D3).

The ProDOS MLI is accessed through the following assembly language coding sequence:

```
JSR  $BF00          ;in ProDOS global page
DB   call_number    ;tells which MLI function
DW   parameter_list ;-->function parameter list
```

The MLI is entered through the ProDOS global page at $BF00. The MLI picks up the call number following the JSR instruction. This identifies which MLI function is to be performed. The MLI then picks up the parameter list pointer following the call number. The parameter list contains information specific to each function (we will define a macro to build these). Return from the MLI is to the instruction following the parameter list pointer. Return is with carry clear and A register set to 0 for no error. Otherwise, if an error occurred, carry is set, and the A register contains the error code (see Table 5).

Assembly Language Macros

The general form of a macro definition is as follows:

```
name  MAC  ;MAC defines beginning of macro
        .  ;
        .  ;macro statements
        .  ;
      EOM  ;EOM defines end of macro
```

The macro name is coded in the label field of the line containing the MAC opcode. This name is used later to invoke or call the macro definition. Subsequent lines contain assembler statements that define the macro. The end of macro is indicated by the EOM opcode. Each macro can have up to eight parameters, designated as]1 through]8 in the macro definition. Here is the macro definition to generate the code for an MLI call:

```
MLI  MAC            ;call_number;
                    parameter_list
     JSR  $BF00
     DB   ]1
     DW   ]2
     EOM
```

The macro name, MLI, is coded as the label parameter. The comments are optional documentation for the macro parameters to be supplied. This macro has

Table 1 — MLI Call Numbers

MLI Call Number	Function
$40	ALLOC_INTERRUPT
$41	DEALLOC_INTERRUPT
$65	QUIT
$80	READ_BLOCK
$81	WRITE_BLOCK
$82	GET_TIME
$C0	CREATE
$C1	DESTROY
$C2	RENAME
$C3	SET_FILE_INFO
$C4	GET_FILE_INFO
$C5	ON_LINE
$C6	SET_PREFIX
$C7	GET_PREFIX
$C8	OPEN
$C9	NEWLINE
$CA	READ
$CB	WRITE
$CC	CLOSE
$CD	FLUSH
$CE	SET_MARK
$CF	GET_MARK
$D0	SET_EOF
$D1	GET_EOF
$D2	SET_BUF
$D3	GET_BUF

two parameters,]1 for the call number and]2 for the parameter list. Here is an example macro call with the code generated by the assembler:

```
MLI  $C8;openparm
JSR  $BF00
DB   $C8
DW   openparm
EOM
```

Macro operands may be constants (like $C8) or symbols defined in the program (openparm). Operands are separated by semicolons. A macro definition is invoked by coding the macro name in the opcode field just like a standard assembler instruction. It may have a label in the label field.

As additional macros are developed, refer to the sample program listings for the code. The assembler opcode EXP OFF is used to suppress listing of the macro generated code (line #4 of Listing 1, which happens to be suppressed by Merlin). For your initial assemblies, use EXP ON to see the generated code. EXP OFF is necessary to cut down the volume of assembler output (I also used TR ON in line #5 to suppress additional lines of hex data for storage definition opcodes).

So Why Use Macros?

A macro is a shorthand notation for including a fixed sequence of instructions into a program. More important, macro parameters are used to generate different versions of these instructions. Each operand of a macro call is passed to the code generation portion of the assembly. The macro operands then replace the macro parameters,]1 through]8, when code is generated. In addition, conditional assembly instructions — DO, IF, ELSE, FIN — may be coded within a macro definition. The conditional assembly opcodes can test the operands and direct code generation.

An immediate observation is that heavy use of macros will tend to slow down the assembler. However, macros improve your ability to generate code. Once you have established a well defined set of macros, they can be saved on a separate macro file to be included in other programs (the Merlin USE opcode). Macros serve another purpose: they generate the same code sequence each time. Macros provide an important tradeoff — using computer time instead of your time to generate code.

One of my biggest problems is remembering addresses of ROM routines and which registers hold which values. I normally remember the functional name,

Listing 1

```
1     * The ProDOS MLI & Assembler Macros
2     *
3     * Listing 1: Binary file read and write
6     *
7     * Macro Definitions
8     *
9     MLI       MAC                 ;call_number;parameter_list
10              JSR   $BF00
11              DB    ]1
12              DW    ]2
13              EOM
14    MLIE      MAC                 ;call_number;parameter_list
15              MLI   ]1;]2
16              BCC   *+5
17              JSR   MLIERROR
18              EOM
19    OPEN      MAC                 ;file
20              MLIE  $C8;]1+43
21              LDA   ]1+48
22              STA   ]1+39
23              STA   ]1+50
24              STA   ]1+54
25              STA   ]1+62
26              EOM
27    READ      MAC                 ;file;address;length
28              LDA   #]2
29              STA   ]1+55
30              LDA   #]2/256
31              STA   ]1+56
32              LDA   #]3
33              STA   ]1+57
34              LDA   #]3/256
35              STA   ]1+58
36              MLIE  $CA;]1+53
37              EOM
38    WRITE     MAC                 ;file;address;length
39              LDA   #]2
40              STA   ]1+55
41              LDA   #]2/256
42              STA   ]1+56
43              LDA   #]3
44              STA   ]1+57
45              LDA   #]3/256
46              STA   ]1+58
47              MLIE  $CB;]1+53
48              EOM
49    CLOSE     MAC                 ;file
50              MLIE  $CC;]1+61
51              LDA   #0
52              STA   ]1+39
53              STA   ]1+50
54              STA   ]1+54
55              STA   ]1+62
56              EOM
57    FCB       MAC                 ;path;buffer
58              DB    7             ;---->CREATE
59              DW    ]1
60              DB    $C3,0,0,0,1,0,0,0,0
61              DB    1             ;---->PREFIX;DELETE
62              DW    ]1
63              DB    2             ;---->RENAME
64              DW    ]1,]1+64
65              DB    10            ;---->GET/SET INFO
66              DW    ]1
67              DB    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
68              DB    2             ;---->MARK,EOF
69              DB    0,0,0,0
70              DB    3             ;---->OPEN
71              DW    ]1,]2
72              DB    0
```

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```
                        73              DB      3               ;---->NEWLINE
                        74              DB      0,0,0
                        75              DB      4               ;---->READ,WRITE
                        76              DB      0,0,0,0,0,0,0,0
                        77              DB      1               ;---->FLUSH,CLOSE
                        78              DB      0,0
                        79              EOM
                        80      *
                        81      * Example of a binary file load operation
                        82      *
                        83              OPEN    FILE
                        84              READ    FILE;$2000;1000
                        85              CLOSE   FILE
                        86      *
                        87      * Example of a binary file save operation
                        88      *
                        89              OPEN    FILE
                        90              WRITE   FILE;$2000;1000
                        91              CLOSE   FILE
80A4:  60               92              RTS
                        93      *
                        94      * Simple Error Handling Routine
                        95      *
                        96      CROUT   EQU     $FD8E
                        97      COUT    EQU     $FDED
                        98      PRNTAX  EQU     $F941
                        99      PRBYTE  EQU     $FDDA
80A5:  48               100     MLIERROR PHA                    ;PUSH ERROR CODE
80A6:  20 8E FD         101             JSR     CROUT           ;RETURN
80A9:  A9 A4            102             LDA     #"$"
80AB:  20 ED FD         103             JSR     COUT
80AE:  68               104             PLA
80AF:  20 DA FD         105             JSR     PRBYTE          ;DISPLAY ERROR CODE
80B2:  A9 A0            106             LDA     #$A0            ;SPACE
80B4:  20 ED FD         107             JSR     COUT
80B7:  A9 A4            108             LDA     #"$"
80B9:  20 ED FD         109             JSR     COUT
80BC:  68               110             PLA                     ;RETURN FROM STACK
80BD:  AA               111             TAX
80BE:  68               112             PLA
80BF:  20 41 F9         113             JSR     PRNTAX          ;PRINT RETURN ADDRESS
80C2:  20 8E FD         114             JSR     CROUT
80C5:  A9 00            115             LDA     #0              ;CLOSE ALL FILES
80C7:  8D 52 81         116             STA     FILE+62
                        117             CLOSE   FILE
80E3:  4C 00 BE         118             JMP     $BE00           ;RESTART BASIC.SYSTEM
                        119     *
                        120     * File control blocks
                        121     *
80E6:  16 AF CD         122     PATH1   STR     "/MLI.MACROS/TEST.FILE1"
80FD:  16 AF CD         123     PATH2   STR     "/MLI.MACROS/TEST.FILE2"
                        124     FILE    FCB     PATH1;BUFFER
8154:  00 00 00         125             DS      \               ;256 byte boundary
8200:  00 00 00         126     BUFFER  DS      1024,0


--End assembly, 1536 bytes, Errors: 0
```

like PRNTAX or GETLIN. By defining a macro with these names, I don't have to remember hex addresses or register usage. Overall, macro generated standard instruction sequences will improve programming productivity, but will also produce somewhat fatter code. The technique here is to generate the program, debug the logic, and then optimize where necessary to improve speed and reduce memory requirements.

Holy Macro, Let's Move Along

Now that we have seen a simple macro definition and an example for using that macro, what is next? It should be fairly obvious that we don't want to program our entire application using one macro. We want to deal with files in higher level terms like open, close, read, and write. Before we proceed to define macros for these functions, we need to expand on one of our deferred topics — MLI parameter lists.

A parameter list is used to pass information to the MLI. The parameter list is pointed to by the MLI calling sequence. Each MLI call has a separate parameter list, although many calls share common parameters and common parameter lists.

We will be using the MLI macro to generate the MLI calling sequence. At this point, we need a macro to generate the MLI parameter list for each call. For this function, we are going to use a single macro definition to generate several parameter lists. A program might have several different read macros to access data from a file. However, all read macros for the same file should use the same parameter list. In general, a parameter list, or set of parameter lists, will be sufficient for all operations on a single file.

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Table 2 presents a macro that can be used for MLI parameter lists. The generated storage area is 64 bytes long and includes all of the parameter lists for MLI file calls. Each separate parameter list is labeled and each field is commented (although one would not store the comments as part of the macro). Each parameter list begins with a parameter count that is cross checked by the MLI against the MLI call number. Under Merlin Pro, the labels are local symbols known only within the macro definition, so this macro may be used to generate multiple sets of parameter lists for different files (although the labels are not needed and will not be used).

We will use the FCB macro to generate a file control block (set of parameter lists) for each file. Therefore, we do not have to worry about loading and saving information from a particular parameter list in order to change files. In addition, macro parameters are used to set up the pathname and buffer pointers. Date and time fields are automatically handled by ProDOS. The remaining fields are set up by particular macro calls or contain values returned by ProDOS. Several of the parameter lists are used by more than one MLI call (i.e., close and flush; set and get for prefix, mark, buf, and eof; read and write).

By design, the FCB macro also maps the parameter lists as they appear in the BASIC.SYSTEM global page. We will take advantage of this when we use the global page fields later on.

Two additional storage definitions are needed. One is for the ProDOS pathname (up to 64 bytes; two pathname fields for rename) and the other is for the ProDOS file buffer (1K or four pages on a page boundary). Pathname is used by create, rename, prefix, destroy (delete), get/set file info, and of course, open (in other words, these MLI calls work on files that are not open). All others use the file reference number (REF#) that is returned by the open MLI call.

In order to access a file, we will code the FCB macro to generate the parameter lists, followed by the pathname definition and buffer:

```
FILE1    FCB PATH1;BUFFER1
PATH1    DS  64,0     ;Space for
                      pathname
         DS  M        ;to 256 byte
                      boundary
BUFFER1  DS  1024,0   ;ProDOS buffer
                      area
```

The FCB macro will generate the parameter lists, fill in the pathname pointers and buffer pointer. Other parameter values, such as file type and file access (Table 3 and Table 4) are returned by ProDOS for a get file info call, and will be set by macro calls for create file and set file info. FILE1 is the name on the FCB macro call that will be used as an operand for other macros that use the parameter lists.

So Where Is The Program?

Before turning to Listing 1, one point must be clarified. ProDOS features can be accessed by an assembly language program through the MLI, or via Applesoft programs using BASIC.SYSTEM (direct and deferred commands). Our sample program does not use any features of BASIC.SYSTEM, except the warmstart routine after an MLI error has been trapped. As such, we must code our own error recovery routine. If you develop a system program (file type SYS), then you must code your own error handling routines. In a later issue on this topic, we will use the error recovery facilities of BASIC.SYSTEM.

Turn to Listing 1 and work your way through the macro definitions (macros must be defined at the beginning of the program). The MLI macro is the same, but is followed by a macro definition for MLIE (indicating an MLI call with error checking). The MLIE macro definition uses the MLI macro (a nested macro call). MLIE tests for an error (see Table 5 for error codes). If an error occurs, a very simple error routine is invoked.

This error routine displays the MLI error code and the address of the macro that invoked the error routine (actually the return address from JSR MLIERROR). My first cut at an error routine was simply a BRK opcode following the BCC instruction. However, this takes you to the monitor, and disconnects ProDOS. Therefore, I coded a simple routine to give you the error indicator with a clean exit back to command level. Later on, this routine can be expanded to a general purpose diagnostic routine for handling MLI error returns. For now, all of

Table 2 — File Control Block Macro

```
FCB       MAC              ;PATH;BUFFER
FCREATE   DB    7          ;---->CREATE
          DW    11         ;PATHNAME
          DB    $C3        ;FILE ACCESS
          DB    0          ;FILE TYPE
          DW    0          ;AUX TYPE
          DB    1          ;STORAGE TYPE
          DW    0          ;CREATE DATE
          DW    0          ;CREATE TIME
FDELETE   DB    1          ;---->PREFIX,DELETE
          DW    11         ;PATHNAME
FRENAME   DB    2          ;---->RENAME
          DW    11         ;PATHNAME 1
          DW    11+64      ;PATHNAME 2
FGETINFO  DB    10         ;---->GET/SET INFO
          DW    11         ;PATHNAME
          DB    0          ;FILE ACCESS
          DB    0          ;FILE TYPE
          DW    0          ;AUX TYPE
          DB    0          ;STORAGE TYPE
          DW    0          ;BLOCKS
          DW    0          ;CHANGE DATE
          DW    0          ;CHANGE TIME
          DW    0          ;CREATE DATE
          DW    0          ;CREATE TIME
FGETMARK  DB    2          ;---->MARK,EOF
          DB    0          ;REF#
          DB    0,0,0      ;MARK & EOF
FOPEN     DB    3          ;---->OPEN
          DW    11         ;PATHNAME
          DW    12         ;FILE BUFFER
          DB    0          ;REF#
FNEWLINE  DB    3          ;---->NEWLINE
          DB    0          ;REF#
          DB    0          ;ENABLE MASK
          DB    0          ;NEWLINE CHAR
FREADWRT  DB    4          ;---->READ,WRITE
          DB    0          ;REF#
          DW    0          ;I/O BUFFER
          DW    0          ;REQUEST COUNT
          DW    0          ;TRANSFER COUNT
FCLOSE    DB    1          ;---->FLUSH,CLOSE
          DB    0          ;REF#
          DB    0
          EOM
```

Table 3 — File Types (* = Apple II SOS only)

File Type	Hex	Preferred Use
	$00	Typeless
* BAD	$01	Bad block file
* PCD	$02	Pascal code file
* PTX	$03	Pascal text file
TXT	$04	ASCII text file
* PDA	$05	Pascal data file
BIN	$06	Binary file
* FNT	$07	Font file
* FOT	$08	Graphics screen file
* BA3	$09	Business Basic program
* DA3	$0A	Business Basic data
* WPF	$0B	Word processor file
* SOS	$0C	SOS
DIR	$0F	Directory file
* RPD	$10	RPS data file
* RPI	$11	RPS index file
ADB	$19	AppleWorks data base
AWP	$1A	AppleWorks word processor
ASP	$1B	AppleWorks spreadsheet
PAS	$EF	PASCAL.AREA on ProFile
CMD	$F0	ProDOS added command
BAS	$FC	Applesoft program file
VAR	$FD	Applesoft variables
REL	$FE	Relocatable code file
SYS	$FF	System file

Table 4 — File Access Bits

Bit # 7654	Bit # 3210	Definition
1...	....	Destroy enable bit
.1..	....	Rename enable bit
..1.	....	Backup needed bit
...0	00..	ProDOS Reserved
....	..1.	Write enable bit
....	...1	Read enable bit
00..	..0.	File is locked
11..	..1.	File is unlocked
xx..	..x.	Any other combination is restricted access

On (1) = enabled (bits 4, 3, 2 must be 0). Off (0) is disabled. Normal is $C3 (or 1100 0011).

Table 5 — MLI Error Codes

A-Reg	Description
$00	No error
$01	Bad system call number
$04	Bad call parameter count
$25	Interrupt vector table full
$27	I/O error
$28	No device connected
$2B	Disk write protected
$2E	Disk switched with file opened
$40	Invalid pathname
$42	Eight files already open
$43	Invalid reference number
$44	Directory not found
$45	Volume not found
$46	File not found
$47	Duplicate filename
$48	Volume full
$49	Volume directory full
$4A	Incompatable file format, also a ProDOS directory
$4B	Unsupported storage type
$4C	End of file encountered
$4D	Position out of range
$4E	File access error or file locked
$50	File is already open
$51	Directory structure damaged
$52	Not a ProDOS volume
$53	Invalid system call parameter
$55	Volume Control Block table full
$56	Bad buffer address
$57	Duplicate volume
$5A	File structure damaged

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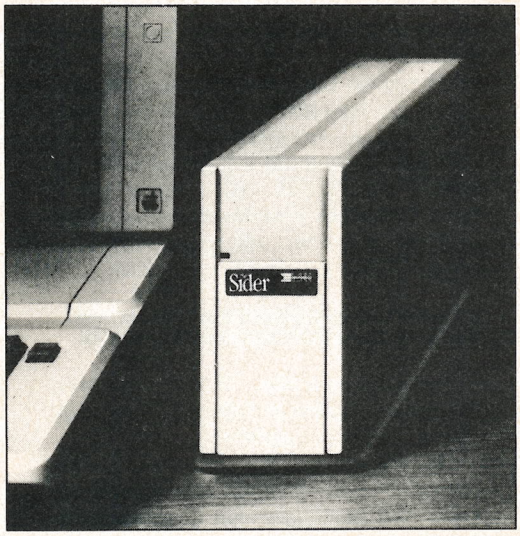

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the macros use MLIE. Later on, we will want to use MLI directly in order to provide different code for error checking (end of file for example).

The next four macros, OPEN, READ, WRITE, and CLOSE, make use of the parameter lists generated by FCB (the FCB macro definition is coded slightly differently to cut down on the listing size). To simplify the assembly, absolute addresses are used by the macros ($BF00) and numeric offsets are used into the parameter lists.

The OPEN macro has one parameter, which is the label given on the FCB macro call. OPEN issues the MLIE macro, and copies the file reference number (returned by ProDOS) from the OPEN parameter list to the other parameter lists (it will be used later by other macros). The open parameter list passes a pathname pointer and buffer pointer to the MLI. The pathname is used to find the file. The 1K buffer is used by ProDOS for data blocks (512 bytes) and the file index block (512 bytes).

The READ and WRITE macros each have three parameters. In addition to the file parameter used by OPEN, memory address and length are set up by the macro call. Memory address is the location where the data will be placed by the MLI. Later on, we will add code to READ for testing end of file. The parameter list for read and write includes two count fields: one for bytes requested and another for bytes transferred. End of file is not indicated until you attempt to read past the file length (see later section for discussion). The transfer count indicates how many bytes were actually read or written.

CLOSE also uses the file parameter. CLOSE clears the file reference number from each parameter list after successful return from the MLI. This is not absolutely necessary, but will avoid problems later. A value of zero for the file reference number will close all open files (used in the error routine).

In Listing 1, the sample macro calls for binary file load/save work with the same file. I suggest you perform your initial tests with this program on a spare diskette formatted by FILER with volume name /MLI.MACROS/. For this program to work as is, the binary files referenced in PATH1 and PATH2 must already exist. Use:

```
BSAVE /MLI.MACROS/TEST.FILE1,A$2000,L1000
BSAVE /MLI.MACROS/TEST.FILE2,A$2000,L500
```

to create the test files. Thus far, we have programmed a load and save, or essentially a binary file copy operation.

As you can see, the code from line 83 through 91 is very simple and straightforward. The tough part was developing the macros. From here on, we will make simple extensions to the macros to enhance our ability to use the MLI. For our first change, Listing 2 has the additional code to copy TEST.FILE1 to TEST.FILE2.

For this process, an additional FCB macro was coded and the second buffer area was added. The output operation simply used the new FCB name (FILE2). It was not necessary to use a second set of file control blocks. However, later operations will have both files open at the same time, so the additional control blocks were added now.

File Length And Positioning

ProDOS maintains two pointers when processing a file. One is the file mark and the other is file length (end of file, or eof). These two pointers are related. EOF is a pointer indicating the length in bytes, and MARK is a pointer defining the current position in an open file. Both are moved automatically by ProDOS and the current values can be obtained with the GET_EOF and GET_MARK MLI calls.

EOF indicates the number of bytes that can be read from a file. As a pointer, it points one byte past the last character in the file (the first byte of a file is byte 0). As a pointer, MARK indicates the next byte to be read from a file, or the next byte to be written to a file. The value for MARK cannot exceed EOF.

EOF can be set to any value (0 to 16 megabytes minus one). SET_EOF can be used to make a file smaller or larger. SET_MARK can be used to position anywhere within a file for reading or writing (such as processing Applesoft random access text files).

Some Extensions

Our sample program is very simple and quite limited. We would like to read any file for input and write to any file for output (same file type). In addition, create the output file if it does not exist. Also, allow for copying a file that will not fit into memory. If the input file is locked, we will lock the output file. Anything else? Oh, yes. Handle end of file on input and file type conflict if the output file exists but is not the same type as the input file.

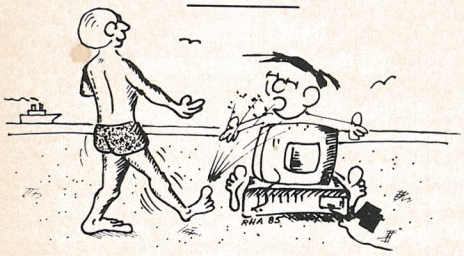
Sound tough? Not at all! With our space exhausted for this edition, we should all work on the changes and compare notes in the next installment of ProDOS MLI & Assembler Macros.

Listing 2

```
                        1     * The ProDOS MLI & Assembler Macros
                        2     *
                        3     * Listing 2: Binary file copy
                       83     *
                       84     * Example of a binary file load operation
                       85     *
                       86               OPEN  FILE1
                       87               READ  FILE1;$2000;1000
                       88               CLOSE FILE1
                       89     *
                       90     * Example of a binary file save operation
                       91     *
                       92               OPEN  FILE2
                       93               WRITE FILE2;$2000;1000
                       94               CLOSE FILE2
0A4: 60                95               RTS
                      124     *
                      125     * File control blocks
                      126     *
0E6: 16 AF CD         127     PATH1     STR   "/MLI.MACROS/TEST.FILE1"
0FD: 16 AF CD         128     PATH2     STR   "/MLI.MACROS/TEST.FILE2"
                      129     FILE1     FCB   PATH1;BUFFER1
                      130     FILE2     FCB   PATH2;BUFFER2
8194: 00 00 00        131               DS    \           ;256 byte boundary
8200: 00 00 00        132     BUFFER1   DS    1024,0
8600: 00 00 00        133     BUFFER2   DS    1024,0

--End assembly, 2560 bytes, Errors: 0
```


I WAS A BASIC WIMP!



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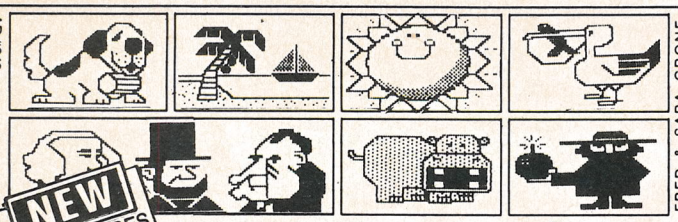

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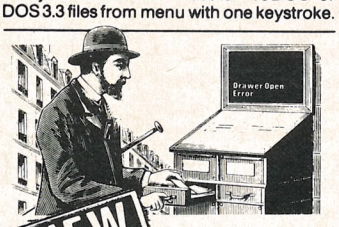

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```
1 HOME: INVERSE: PRINT CHR$(21)
2 X=RND(1)*24+1: VTAB X: HTAB X:
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```

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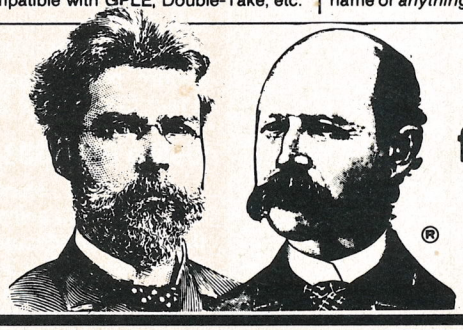

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Accessing DOS 3.3 Disks from Pascal

Christopher Howerton

SOME people, myself included, find the Apple Pascal system to be a much more pleasant working environment than DOS 3.3 or even ProDOS. Unfortunately, judging from the relative quantities of programs available, there must be another group which prefers DOS 3.3 diskettes, but may not wish to violate ones principles by working with BASIC! The use of Procedure RWTS33 (which I have put in my SYSTEM.LIBRARY) can help. The procedure name stands for "Read/Write a Track/Sector from DOS 3.3."

Using RWTS33

Listing 1 exemplifies the use of RWTS33 with a short program which will dump (in hexadecimal) the contents of any sector on a DOS 3.3 diskette. It shows how easily RWTS33 can be incorporated into a program. Besides using RWTS33, the program makes use of one other procedure, W_HEX, which, (thanks to MOD, DIV and CASE), shows how elegant even simple Pascal is compared to BASIC. Using RWTS33 and W_HEX gives one the basis of a DISK ZAP program. With slight modifications (mostly deletions from RWTS33), a Pascal Disk Zap program could easily be written.

There is very little in this program which hasn't been done before. However, unlike most published Pascal programs, it does not use any advanced techniques, and is therefore easier for novice Pascal programmers to understand. Since I believe that a person learns more from examining programs than by reading articles explaining how a program works, there will be no further explanation in this article. . . but there are a lot of comments in the program that you should read!

Tips for Beginning Pascal Programmers

Part of the reason for the existence of this program is that it does something useful, but another reason is to instruct. So, here are some "helpful hints" for novices to pay special attention to as they examine the program:

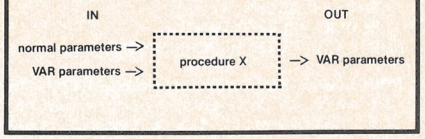
- Even very short things are worth making into a procedure if they are to be used often. For example, the two-line PROCEDURE W allows control over where a string is printed on the screen, and W is a lot shorter than WRITELN if you are a slow typist. I use it all the time!
- The use of CONST (constants) in the declaration section of the program for the maximum number of tracks and sectors on a diskette will simplify modifications should a different capacity disk drive be used. "Magic constants" spread throughout a program are bad style—especially when you try to modify the program!
- (*$I-*) allows a Pascal programmer to "capture" I/O errors without the program stopping. IORESULT is a function which returns the error code after the last I/O operation. Depending upon what it is, appropriate action may be taken. (In the case of this program, a clear, understandable error message is written explaining what the problem seems to be.
- Notice that RWTS33 has procedures declared *inside* it. These procedures are only known to RWTS33. The concept is analagous to local vs. global variables (i.e., a variable declared inside a procedure is only known to that procedure and will not be confused with a variable of the same name in another procedure).
- CASE statements are super-IF statements. Only one of the alternatives will be chosen. A good example of a CASE statement is in the procedure ERROR_MESSAGE. Note that the default message is set before entering the CASE.

- Apple Pascal only counts the first 8 letters of a variable. Still, using long procedure names such as COMPUTE_BLOCK_NUMBER can make a well written Pascal program approximate English *Long Variable Names do not produce longer code file!*

- EXIT is a wonderful procedure which I think is under-used. It allows one to exit a function or procedure and can often help avoid those infinitely nested THENs and ELSEs. Just be sure that any variable which needs to be given a value is given one before EXITing!

- For the novice, this one's important. You may have been experiencing trouble understanding why some parameters to a procedure have the word VAR in front of them and some don't. The reason is simple. Parameters are the way that a procedure communicates with other procedures or the main program. Without them, Pascal would be no better than BASIC—you know the problem . . . a subroutine called from one part of a BASIC program uses, and changes, a variable used in another part. As much as possible, a programmer should attempt to isolate procedures so that all communication is done via parameters. (There are 2 ways to communicate. INPUT and OUTPUT. Variables which are only INPUT to a procedure, and which the procedure will not change, do *not* have a VAR in front of them. Variables which are the procedure's OUTPUT do have VAR in front of them. Of course, a picture is worth 1024 words, so:)

Figure 1



Well, that's about it. I hope that you find RWTS33 to be a useful routine. But more importantly, I hope that you find it instructive.

Listing 1

```
PROGRAM TEST_RWTS33;
(* a short program designed to show how RWTS33 works *)
TYPE SECTORBUFFER = PACKED ARRAY[0..255] OF 0..255;
VAR INDEX,BYTE,T,S:INTEGER;
    ERR:BOOLEAN;
    SB:SECTORBUFFER;

(*=============================================================================*)

PROCEDURE RWTS33(DIRECTION:CHAR;UNITNUMBER,TRACK,SECTOR:INTEGER;
                 VAR SECTBUF:SECTORBUFFER;VAR ERROR:BOOLEAN);
(*****************************************************************)
(* reads or writes a track/sector off of a normal DOS 3.3 disk   *)
(*   (may not work with modified DOS)                            *)
(*                                                               *)
(* input:                                                        *)
(* ------                                                        *)
(*    DIRECTION  : 'R' to read sector, 'W' to write              *)
(*    UNITNUMBER : the disk to use (4 is drive #1, 5 is drive #2) *)
(*                 (other legal unitnumbers are 9, 10, 11 and 12) *)
(*    TRACK      : the track to use (0 to 34)                    *)
(*    SECTOR     : the sector to use (0 to 15)                   *)
(*                                                               *)
(* output:                                                       *)
(* -------                                                       *)
(*    SECTBUF    : holds one sector's bytes                      *)
(*                 packed array [0..255] of 0..255               *)
(*    ERROR      : TRUE if a problem occured, FALSE otherwise    *)
(*                                                               *)
(*****************************************************************)
CONST MAXTRACK = 34;
      MAXSECTOR = 15;
TYPE BLOCKBUFFER = PACKED ARRAY [0..511] OF 0..255;
VAR BLOCK : BLOCKBUFFER;
    ERR_NUM,BLOCKNUM,HALF:INTEGER;

PROCEDURE W(X,Y:INTEGER;S:STRING);
 (* a nifty little routine!  Everyone should use it! *)
BEGIN
  GOTOXY(X,Y);
  WRITE(S)
END;

PROCEDURE COMPUTE_BLOCK_NUMBER(TRACK,SECTOR:INTEGER;VAR BLOCK,HALF:INTEGER);
 (* given a DOS 3.3 sector number, this procedure returns which half of      *)
 (*  which Pascal block the desired DOS 3.3 sector is on.  Note that Pascal  *)
 (*  blocks are 2 DOS sectors in size (512 as opposed to 256 bytes).  Also   *)
 (*  note that Pascal refers to block numbers (0 to 279 on a normal capacity *)
 (*  diskette) rather than tracks and sectors.  This allows Pascal more      *)
 (*  flexibility when using different capacity disk drives.  Finally, note   *)
 (*  that Pascal and DOS store their sectors in different orders on a track  *)
 (*  (which is one reason that disk I/O is faster with Pascal).  Both sector *)
```

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```
 (*  interleaving schemes are explained on page 3-23 of the book:          *)
 (*                                                                        *)
 (*       BENEATH APPLE DOS  by Worth and Lechner  (Quality Software publ.)*)
 (*                                                                        *)
 (*  Due to the fact that this routine assumes normal interleaving of DOS  *)
 (*   sectors, it will not work with many of the modified DOSes such as    *)
 (*   DIVERSIDOS, DAVID DOS and ProDOS.                                    *)
VAR BLK:INTEGER;
BEGIN
  CASE SECTOR OF
     0:BEGIN BLK:=0; HALF:=1 END;
     1:BEGIN BLK:=7; HALF:=1 END;
     2:BEGIN BLK:=6; HALF:=2 END;
     3:BEGIN BLK:=6; HALF:=1 END;
     4:BEGIN BLK:=5; HALF:=2 END;
     5:BEGIN BLK:=5; HALF:=1 END;
     6:BEGIN BLK:=4; HALF:=2 END;
     7:BEGIN BLK:=4; HALF:=1 END;
     8:BEGIN BLK:=3; HALF:=2 END;
     9:BEGIN BLK:=3; HALF:=1 END;
    10:BEGIN BLK:=2; HALF:=2 END;
    11:BEGIN BLK:=2; HALF:=1 END;
    12:BEGIN BLK:=1; HALF:=2 END;
    13:BEGIN BLK:=1; HALF:=1 END;
    14:BEGIN BLK:=0; HALF:=2 END;
    15:BEGIN BLK:=7; HALF:=2 END;
  END;(*CASE*)
  BLOCK:=BLK+8*TRACK;
END;(*COMPUTE_BLOCK_NUMBER*)

PROCEDURE RE_READ(UNITNUMBER:INTEGER;BLOCK:BLOCKBUFFER;BYTES,BLOCKNUM:INTEGER);
 (* when an I/O error occurs while attempting to READ a diskette *)
 (*  RWTS33 will try a second time before giving up.  Often, the *)
 (*  error is a transient one due to a non-centered diskette.    *)
VAR PAUSE:CHAR;
BEGIN
  PAGE(OUTPUT);
  W(0,0,'An error occurred while trying to read the diskette');
  W(5,2,'Please   1) open the disk drive door');
  W(14,3,'2) close the disk drive door');
  W(0,5,'With a little luck, the error occurred because the');
  W(1,6,'diskette was not centered');
  W(0,9,'press the SPACE BAR to continue');
  WRITELN;
  UNITCLEAR(1);                                  (* clear keyboard buffer    *)
  READ(PAUSE);
  (*$I-*)                                        (* we do our own I/O checks *)
  UNITREAD(UNITNUMBER,BLOCK,BYTES,BLOCKNUM);
  (*$I+*)
END; (*RE_READ*)

PROCEDURE ERROR_MESSAGE(NUMBER:INTEGER);
 (* prints the appropriate error message - usually due to IORESULT *)
 (* but sometimes due to a non-valid parameter to RWTS33           *)
VAR MESSAGE:STRING;
    PAUSE:CHAR;
BEGIN
  PAGE(OUTPUT);
  W(0,0,'***  An ERROR has occurred in the part of the  ***');
  W(0,1,'***  program which reads or write to the disk  ***');
  W(5,3,'Error Number = ');WRITE(NUMBER);
  MESSAGE:='See page 280 of the Apple Pascal Operating System Manual';
  CASE NUMBER OF
    5:MESSAGE:='Disk drive disconnects itself - probably a hardware error';
    8:MESSAGE:='No room left on the diskette';
    9:MESSAGE:='The drive specified (2nd parameter of RWTS33) is not on-line';
   16:MESSAGE:='The disk is write protected!  (The notch is covered)';
   64:MESSAGE:='Probably a bad diskette, but maybe a bad disk drive';
   17:MESSAGE:='1st parameter to RWTS33 must be ''R'' or ''W'' ';
   18:MESSAGE:='2nd parameter to RWTS33 is not a legal drive (4,5,9,10,11,12)';
   19:MESSAGE:='3rd parameter to RWTS33 is not a legal track (0 to 34)';
   20:MESSAGE:='4th parameter to RWTS33 is not a legal sector (0 to 15)'
  END;(*case*)
  W(5,5,MESSAGE);
  W(0,7,'press SPACE BAR to continue');
  WRITELN;
  UNITCLEAR(1);
  READ(PAUSE)
END;(*ERROR_MESSAGE*)

PROCEDURE CHECK_PARAMETERS(RW:CHAR;DRIVE,TRK,SEC:INTEGER;VAR E:BOOLEAN);
 (* checks that the four input parameters to RWTS_T_S are valid *)
VAR ERROR_NUMBER:INTEGER;
BEGIN
  E:=FALSE;
  ERROR_NUMBER:=0;
  IF NOT (RW IN ['R','r','W','w'])   THEN ERROR_NUMBER:=17;
  IF (DRIVE < 4) OR (DRIVE > 12) OR
     ((DRIVE >= 5) AND (DRIVE <= 8)) THEN ERROR_NUMBER:=18;
  IF (TRK < 0) OR (TRK > MAXTRACK)   THEN ERROR_NUMBER:=19;
  IF (SEC < 0) OR (SEC > MAXSECTOR)  THEN ERROR_NUMBER:=20;
  IF ERROR_NUMBER <> 0
    THEN BEGIN
           ERROR_MESSAGE(ERROR_NUMBER);
           E:=TRUE
         END;
END; (*CHECK_PARAMETERS*)
```

```
BEGIN (*RWTS33*)
  CHECK_PARAMETERS(DIRECTION,UNITNUMBER,TRACK,SECTOR,ERROR);
  IF ERROR THEN EXIT(RWTS33);
  COMPUTE_BLOCK_NUMBER(TRACK,SECTOR,BLOCKNUM,HALF);
  (*$I-*)                                        (* we do our own I/O checks *)
  UNITREAD(UNITNUMBER,BLOCK,512,BLOCKNUM);       (* must read the block even *)
                                                 (*   if writing as 1 block  *)
  (*$I+*)                                        (*   holds 2 sectors        *)
  IF IORESULT <> 0 THEN RE_READ(UNITNUMBER,BLOCK,512,BLOCKNUM);
  ERR_NUM:=IORESULT;
  IF ERR_NUM <> 0
    THEN BEGIN                                   (* read error occured twice  *)
           ERROR_MESSAGE(ERR_NUM);               (* so print an error message *)
           ERROR:=TRUE;                          (* and then leave RWTS33     *)
           EXIT(RWTS33)
         END;
  IF DIRECTION IN ['R','r'] THEN MOVELEFT(BLOCK[256*(HALF-1)],SECTBUF,256);
  IF DIRECTION IN ['W','w']
    THEN BEGIN
           MOVELEFT(SECTBUF,BLOCK[256*(HALF-1)],256);
           (*$I-*)                               (* we do our own I/O checks *)
           UNITWRITE(UNITNUMBER,BLOCK,512,BLOCKNUM);
           (*$I+*)
           ERR_NUM:=IORESULT;
           IF ERR_NUM <> 0                       (* no automatic retry with  *)
             THEN BEGIN                          (*  write errors            *)
                    ERROR_MESSAGE(ERR_NUM);
                    ERROR:=TRUE;
                    EXIT(RWTS33)
                  END;
         END;
  ERROR:=FALSE
END;(*RWTS33*)
(*=============================================================================*)

PROCEDURE W_HEX(BYTE:INTEGER);
 (* writes a decimal number between 0 and 255 as two hexidecimal digits *)
 (* note: this procedure does NOT check that BYTE is between 0 and 255  *)
    PROCEDURE W_HEX_DIGIT(NIBBLE:INTEGER);
     (* writes a decimal number between 0 and 15 as a hexidecimal digit *)
    VAR H:CHAR;
    BEGIN
      IF NIBBLE < 10 THEN WRITE(NIBBLE)
                     ELSE BEGIN
                            CASE NIBBLE OF
                              10:H:='A';
                              11:H:='B';
                              12:H:='C';
                              13:H:='D';
                              14:H:='E';
                              15:H:='F'
                            END;(*CASE*)
                            WRITE(H)
                          END
    END;(*W_HEX_DIGIT*)
BEGIN(*W_HEX*)
  W_HEX_DIGIT(BYTE DIV 16);
  W_HEX_DIGIT(BYTE MOD 16)
END;


BEGIN (* a short example of how RWTS33 works *)
  PAGE(OUTPUT);
  WRITELN('This program shows RWTS33 in action');
  WRITELN;
  WRITE('Please enter which track (0 to 34) to read: ');
  READLN(T);
  WRITELN;
  WRITELN;
  WRITE('Please enter which sector (0 to 15) to read:');
  READLN(S);
  RWTS33('R',4,T,S,SB,ERR);
  IF NOT ERR                    (* show sector on screen if no error *)
    THEN BEGIN
           PAGE(OUTPUT);
           WRITELN('TRACK = ',T,'   SECTOR = ',S);
           WRITELN;
           WRITELN('      0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F');
           WRITE  ('------------------------------------------------------');
           FOR INDEX := 0 TO 255 DO BEGIN
             BYTE:=SB[INDEX];
             IF INDEX MOD 16 = 15     (* new row every 16 bytes *)
               THEN BEGIN             (* label the row          *)
                      WRITELN;
                      W_HEX(INDEX);
                      WRITE(' : ')
                    END;
             W_HEX(BYTE);             (* write the byte in hex  *)
             WRITE(' ');
           END;(*FOR*)
         END(*THEN*)
    ELSE WRITELN('Well, we didn''t read that one too well!');
  WRITELN;
END.
```


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Circle 38 on Reader Service Card

THE Spreadsheet as Illuminator

John Geddis

I was sure it wouldn't be bright enough. We were remodeling the house, and the lights on the plans in the family room just didn't seem right. How could one possibly know if there would be enough light until the fixtures were bought and it was too late? I remembered somewhere that light diminishes in proportion to the square of the distance from it. Armed with this tantalizing bit of information, I headed for the trusty encyclopedia. Under "Lighting and Illumination" I found the rest of the answer. There are some extremely complex methods of measuring illumination. One takes into account reflections from walls, incidental, direct light, and multiple lights. That method gave me far more detail than I needed and it required far more complex information than I could supply. I chose an approximation known as the "point-to-point" method.

Point-to-point assumes that the light bulb is a point source that is hanging in the middle of a field at midnight on a moonless night. The formula I use assumes that the illuminated area is facing directly at the light and is not lying flat or propped up vertically. The formula is: $E = I/(d^2)$. This is fairly straightforward. Maybe I could make a little map of the floor underneath the light and plot the relative intensity falling on each square foot.

Enter The Spreadsheet

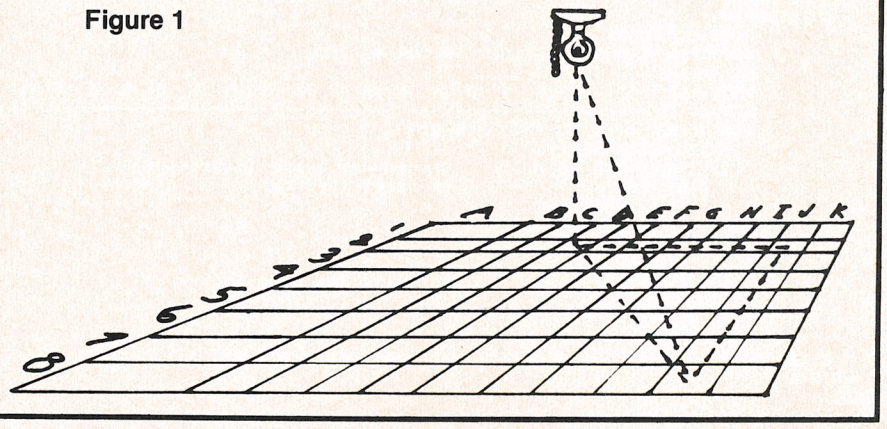
I sure didn't want to program this from scratch using BASIC. All that formatting would just take more time than I wanted to invest in a rather simple question. I did, however, need a useful tool on which I could vary the input to test different data. Spreadsheets already have grids built in. Perhaps that grid could serve as the map I needed.

Program Concept and Operation

Each cell could serve as one square foot of mapped area. After determining that a column width of 3 gave the appearance of squares, I then had to find distance. Figure 1 shows the concept. The light bulb was hanging at a variable height over cell D2. Using cell J8 as a representative cell illuminated by this bulb, the next task was to compute the distance from the light source. Referring again to Figure 1, the best method seemed to be double triangulation using two right triangles. The first right triangle would lie flat on the grid. The two known sides would be formed by the row distance and the column distance. The solution would provide the grid distance between D2 and J8. Remembering some shaky high school geometry, the formula for solving the hypotenuse (D2 to J8) of a right triangle was $c^2 = a^2 + b^2$. Now to take the height of the light bulb into account, I used a new triangle. My new-found hypotenuse formed one leg of the triangle and the height formed the other. Applying the same formula again, the newest hypotenuse gave me the direct distance I needed from J8 to the light bulb. My units of measurement were the "@ROW" and "@COLUMN" functions that are unique to THE Spreadsheet. (If you're using VisiCalc or another worksheet, you'll have to refer to the "tape measure" I installed in row 1 and in column C to get your distance.) Since the illumination on J8 is the intensity of the light divided by the square of the distance, I could eliminate all square roots. The final formula appears at cell D2 in Listing 1.

Figure 2 shows the finished worksheet. As a final capper, I threw a few economic considerations into column A. In addition there are some NOTES which require a little explanation.

Figure 1



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How Bright is Bright?

The issue is calibration. How much light is really falling on that one foot square on cell J8? The discussion begins with the value entered in "intensity" in cell B5. The datum entered here is from the flimsy package that holds the light bulbs when you buy them at the store. On the side of the package are usually the "lumens," the "average life" and the power consumption in "watts".

A lumen is the item of interest here. Going back to the good ol' encyclopedia, we find that a lumen is a measure of luminous flux... a sensible but not very useful definition. If you bought G. E. light bulbs, that corporation has a handy but little-known toll-free phone number you can call (800-262-2000). They will answer any question about one of their products. So I called G. E. and said, "What's a lumen?" Unruffled, Mark Busen, of their technical support staff not only gave me a definition but a common sense explanation of what it means. Here goes... Start with a light source of 1 candela (roughly the equivalent of a candle on the dinner table). Next, build an imaginary sphere around that 1 candela single-point light source whose surface is 1 foot away from the source of light. Finally, punch a 1 square foot hole in that sphere. The amount of light pouring through that hole is one lumen. Now we can calibrate! The numbers in each square foot of THE

```
THE ILLUMINATOR
listing using
THE Spreadsheet 2.0

1) set all columns to width 3.  /GC3
2) set column B to width 6.  /GCC6
3) set column A to width 15.  /GCC15
4) set calculation to manual.  /GRM
5) enter all cell contents at their
   proper addresses.
6) replicate cell D2 to E2 through T2
   with 'No change' in cell
   reference.  /RD2.D2:E2.T2
7) replicate cells D2 through T2 to
   D3 through D19 with 'No change'
   in cell reference.  /RD2.T2:D3.D19
8) protect the entire worksheet.  /GAP
9) unprotect cells B2,B5,B6,B7,B8,B10.
   /AV
10) save it

CELL      CELL
ADDRESS   CONTENTS

C20:      "^^^^
A20:      "floor distance
C19:      17
A19:      "  RECALCULATE !
C18:      16
A18:      "  MANUALLY
C17:      15
A17:      "5-mood
C16:      14
A16:      "10+general
C15:      13
A15:      "50+norm reading
C14:      12
A14:      "90+fine work
C13:      11
A13:      "NOTES
C12:      10
B12:      +B11/B6
A12:      /FR"cost/hour:
C11:      9
B11:      /F$(B9*B6*B5/1000)+1.35
A11:      /FR"total cost:
C10:      8
A10:      "ECONOMICS
C9:       7
A9:       /FR"cost ($/kwh):
C8:       6
A8:       "ELECTRICAL
C7:       5
A7:       /FR"cost ($):
C6:       4
A6:       /FR"life (hrs):
C5:       3
A5:       /FR"watts:
C4:       2
A4:       /FR"intensity:
C3:       1
A3:       "BULB
D2:       @INT(B4/((B2^2)+((@COL-4)
          ^2)+((@ROW-2)^2)))
C2:       0
A2:       /FR"height (ft):
T1:       16
S1:       15
R1:       14
Q1:       13
P1:       12
O1:       11
N1:       10
M1:       9
L1:       8
K1:       7
J1:       6
I1:       5
H1:       4
G1:       3
F1:       2
E1:       1
D1:       0
C1:       " )
B1:       "floor
A1:       "DISTANCE
```


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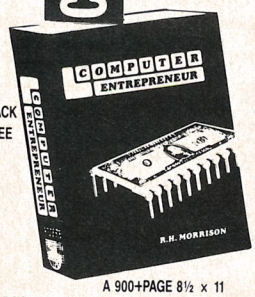

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Circle 17 on Reader Service Card

Spreadsheet's grid are the approximate number of lumens falling on a sheet of paper which is held in there and pointing toward the light.

The brightness levels listed under "NOTES" give the appearance of adhering to some OSHA, environmental, or energy standard. Nothing could be farther from the truth. They are recommendations from a 30 year old encyclopedia. If you want to calibrate them to yourself, put a light bulb into a shadeless table lamp, enter the data into the "Illuminator," measure the distance back to "ground zero" (directly under the light) and use the "Illuminator" to tell how many lumens are falling at that distance. You can then decide for yourself what level is best for fine work, what level for reading, etc.

Filling up the Spreadsheet

Just follow the 9 steps in Listing 1. Be sure to set THE Spreadsheet for manual recalculation (/GRM). Due to the high density of formulae, the Illuminator can take 2 - 3 minutes to recalculate. You don't need that when you're copying formulae or making corrections. After you've protected the entire "Illuminator" and unprotected the data entry cells (/AV), you can use the TAB / OPEN-APPLE TAB (*IIe*, *IIc*), or the cntrl-I / cntrl-Y (II+) to move through the data fields.

Figure 2

DISTANCE	floor)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
height (ft):	4	0	54	51	43	34	27	21	16	13	10	8	7	6	5	4	4	3	3
BULB		1	51	48	41	33	26	20	16	13	10	8	7	6	5	4	4	3	3
intensity:	870	2	43	41	36	30	24	19	15	12	10	8	7	6	5	4	4	3	3
watts:	60	3	34	33	30	25	21	17	14	11	9	8	6	5	5	4	3	3	3
life (hrs):	1000	4	27	26	24	21	18	15	12	10	9	7	6	5	4	4	3	3	3
cost ($):	1.35	5	21	20	19	17	15	13	11	9	8	7	6	5	4	4	3	3	2
ELECTRICAL		6	16	16	15	14	12	11	9	8	7	6	5	5	4	3	3	3	2
cost ($/kwh):	.08	7	13	13	12	11	10	9	8	7	6	5	5	4	4	3	3	3	2
ECONOMICS		8	10	10	10	9	9	8	7	6	6	5	4	4	3	3	3	2	2
total cost:	6.15	9	8	8	8	8	7	7	6	5	5	4	4	3	3	3	2	2	2
cost/hour:	.006	10	7	7	7	6	6	6	5	5	4	4	4	3	3	3	2	2	2
NOTES		11	6	6	6	5	5	5	5	4	4	3	3	3	3	2	2	2	2
90+fine work		12	5	5	5	5	4	4	4	4	3	3	3	3	2	2	2	2	2
50+norm reading		13	4	4	4	4	4	4	3	3	3	3	3	2	2	2	2	2	1
10+general		14	4	4	4	3	3	3	3	3	3	2	2	2	2	2	2	1	1
5-mood		15	3	3	3	3	3	3	3	3	2	2	2	2	2	2	1	1	1
MANUALLY		16	3	3	3	3	3	2	2	2	2	2	2	2	2	1	1	1	1
RECALCULATE !		17	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
floor distance		^^^																	

This just goes to show that THE Spreadsheet can be a useful tool to have around the house.

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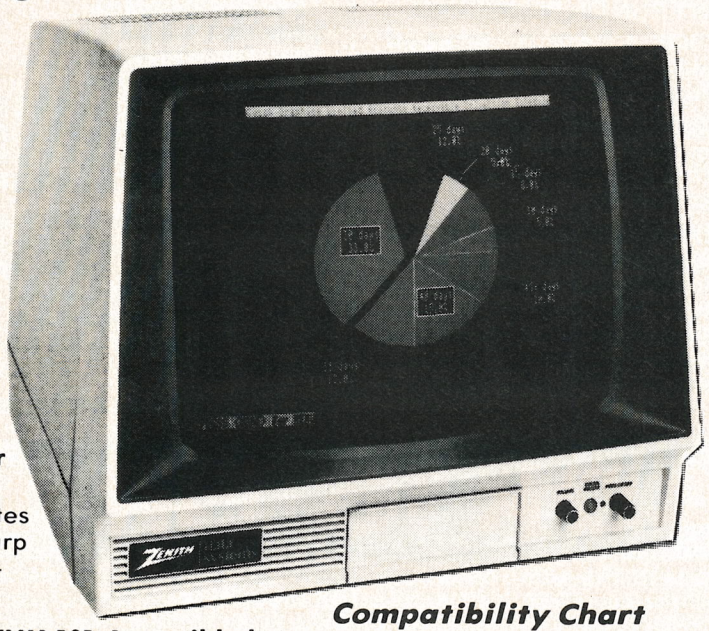

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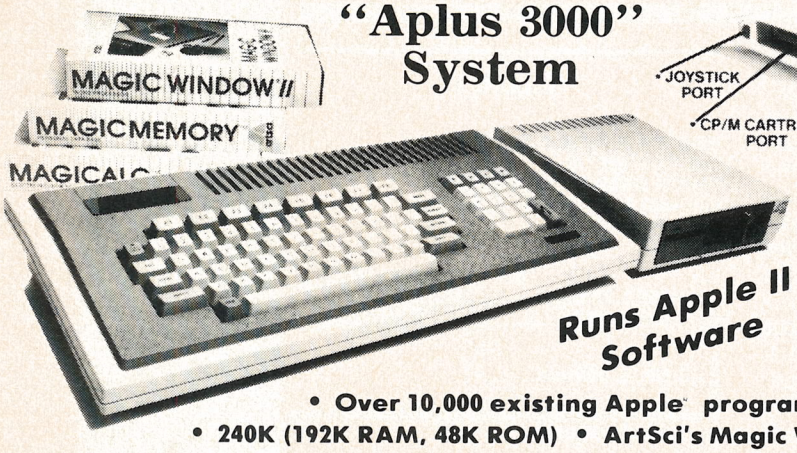

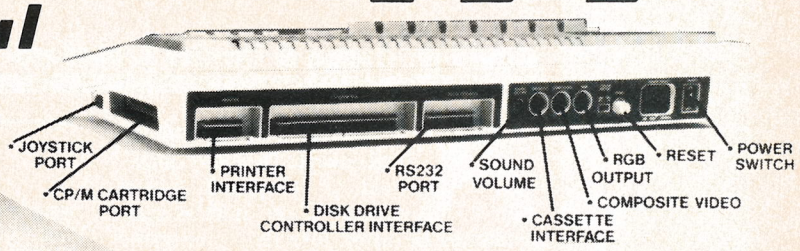

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SPECIFICATIONS

A plus 3000 is a complete, self-contained computer based on the popular 6502A microprocessor and can tap into the tremendous software library of Apple II. Features include 192K Bytes RAM, 32KB Enhanced Microsoft BASIC, 80 column text, 560H X 192V color graphic display, 81 key sculptured keyboard and high efficiency switching power supply. Also included as standard are Centronics bus printer interface, Cassette interface, 4 channel sound generator, and 5¼" Apple Compatible Disk Drive.

- **TEXT**
  - 40 columns X 24 rows or 80 columns X 24 rows software selectable.
  - 5 X 7 characters in 7 X 8 matrix.
  - Upper and lower case characters.
  - One of Eight colors for characters/graphics and background, Red, Green, Blue, Cyan, Magenta, Yellow, Black and White.
  - Character set with normal, inverse and flashing capabilities.
- **GRAPHICS**
  - 280H X 192V 6 colors — Black, White, Violet, Green, Blue, Orange.
  - 280H X 192V 8 colors bit image — Black, White, Red, Green, Blue, Cyan, Magenta, Yellow.
  - 560H X 192V 6 colors — Black, White, Violet, Green, Blue, Orange. (High resolution color monitor required)

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Features	Aplus 3000	Apple IIe	Commodore C-128
RAM	**192K**	64K	128K
Runs Apple II Software	**Yes**	Yes	No
Function Keys	**24**	None	16
4 Voice, 6 Octave Sound	**Yes**	No	Yes
Composite Video	**Yes**	Yes	Yes
Disk Drive	**included**	Extra Cost	Extra Cost
Numeric Keypad	**included**	Extra Cost	Included
Video Cable	**included**	Extra Cost	Extra Cost
RGB Color Card	**included**	Extra Cost	Included
80 Column Card	**included**	Extra Cost	Included
Centronics Printer Interface	**included**	Extra Cost	Extra Cost
Drive Controller	**included**	Extra Cost	Included
$150 Wordprocessor (Magic Window)	**included**	Extra Cost	Extra Cost
$150 Spreadsheet (MagiCalc)	**included**	Extra Cost	Extra Cost
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R/F Modulator (TV hookup)	$ 29.95	$ 19.95
RGB cable (RGB Monitor hookup)	$ 24.95	$ 19.95
Centronics cable (for Centronics printer)	$ 34.95	$ 24.95
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Circle 16 on Reader Service Card

A Lab Instrument Interface

David A. Gregg & Daniel J. Macero

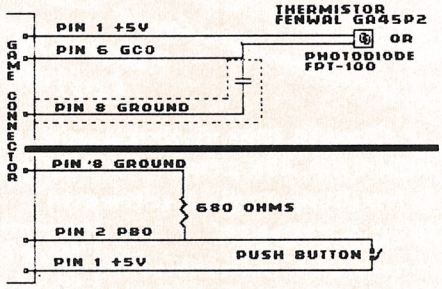
AN Apple II + or Apple *IIe* can be connected to many household or laboratory instruments. These devices may sometimes be wired directly to the game connector. Usually, however, an interface using the peripheral slot connector and containing a voltage, analog to digital converter is required. There are several quite elaborate interfaces with software commercially available to serve this purpose, but prices begin at about $300. The interface described here is adequate for many purposes and can be built easily for about $40. This interface converts D.C. voltages to 8 bit digital data which the computer may access every 100 μ sec. As designed, the analog full scale range may vary from ± mV to ± 5 volts but can be easily changed. Additional function circuits to make the board act as a multimeter for D.C. current, variable voltages, and resistance can be added cheaply, about $2.00 per function. With this interface one can very easily attach a thermometer, light sensitive diode, or any Apple. The completed circuit board may adequately be tested outside the computer with a simple multimeter to guard against wiring errors and short circuits which might damage the computer. Most components are easily obtainable Radio Shack stock items. The National Semiconductor ADC0804 integrated circuit is available from large electronics suppliers for about $4.00; the prototyping board is available at most Apple dealers for about $24.00.

Game IO

Before describing an interface which uses one of the peripheral slot connectors, we must mention that devices which function by a change in resistance may be wired to the Apple game paddle connector with no additional circuitry. Such devices include potentiometers, photodiodes, and thermistors. Examples of the connections required to attach a thermistor or a photodiode to the game connector are shown in Figure 1.

Figure 1

PUSH BUTTON PHOTODIODE OR THERMISTOR CONNECTED TO GAME I/O
CAPACITOR BETWEEN GC0 AND GROUND ALLOWS RESISTANCES OF LESS THAN 150K TO GIVE FULL SCALE READINGS.



GAME CONNECTOR

BACK OF COMPUTER

NC	9	8	GRD
GC1	10	7	GC2
GC3	11	6	GC0
AN3	12	5	C040 STROBE
AN2	13	4	PB2
AN1	14	3	PB1
AN0	15	2	PB0
NC	16	1	+5V

The Applesoft BASIC command PDL(X) reads the resistance connected to the game paddle. X may range from 0 to 3 depending on which game paddle pin is used. The PDL(X) command returns a value of 255 (full scale) when the resistance in the game paddle circuit is 150k ohms, and returns a zero (0) when the resistance is 0. Upon execution, the first action of the PDL(X) command is to charge a capacitor on the motherboard in the game paddle circuit to 5 volts. A software counter is then started and counts until the value of 255 is reached or the voltage across the capacitor drops to a hardware-determined preset value. The value of this count is then returned to BASIC. The time required to

discharge the capacitor is directly proportional to the resistance connected between the two ends of the capacitor. This resistance is usually the variable resistor in the game paddle itself. It is possible to extend the resistance range by connecting a capacitor between the game connector and ground. The bigger the capacitor the more time it takes to discharge across the same resistance. Therefore, by using more capacitance, a smaller resistor can be made to have a full scale reading. Larger resistances can be used by inserting software delays in the counting loop. The software delays, however, must be inserted at the machine code level, and therefore negate the use of the PDL(X) command. Referencing the hexadecimal address $C070 charges all four game connector capacitors. The most significant bit at addresses $C064 thru $C067 goes low when the respective capacitors have discharged. Address $C064 checks Game Connector 0 (GC0); address $C067 checks GC3. The timing loop in the Apple ROMs counts for 3.06 milliseconds. If conversion time is not a major concern, the game paddle can be used effectively for resistance measurements.

Voltage Conversion

Voltage or current measurements, in contrast to resistance measurements, may be accomplished only by using an interface containing a more elaborate analog to digital converter. The converter must be imposed between the output of the voltage or current device and the computer. Perhaps the most common example of a voltage device is a chemical cell (or flashlight battery). Wiring a cell to the game connector would not damage the computer (provided the voltage from the device is less than 5 volts), the computer just couldn't read the information.

Any instrument which has a chart recorder output, a built in voltmeter, or ammeter could be attached to the computer with the proper converter. We mention the ammeter and voltmeter since there are many older or cheaper instruments which can be interfaced to the computer by hooking the computer interface to the leads that attach to the meter of the instrument. With such an interface, the computer can monitor, display, and store data from a wide variety of instruments or simple electrical devices.

An analog to digital interface for the computer may be designed around any of the many integrated circuit (IC) analog to digital converters (ADC) available. These ADCs vary in the voltage ranges they accept, in accuracy, in speed, and in various built in functions. One that we found quite satisfactory was the ADC0804 manufactured by National Semiconductor Corp. This inexpensive converter ($4.05) converts a voltage signal (which may range from 0 to 5 V) to 8 bit data (a number that ranges from 0 to 255). This converter is especially easy to use, since it has built in tri-state buffer data latches essential for attaching the data lines from the converter directly to the data bus of the computer. In addition, the "conversion start," "conversion end," and "read" lines are internally configured so that no address decoding circuitry is needed to allow this circuit to work in the Apple.

Since this converter reads only voltage (not current) in a rather restricted (0 to +5 V) range, it is necessary to have additional circuitry to allow the converter to read other voltage ranges or currents. Fortunately, there are integrated circuit operational amplifiers (op amps) which are readily available. These are inexpensive (less than $1.00) and can be used to amplify and otherwise adjust the incoming signal before it reaches the converter. The "op amps" often come 2 or 4 on a chip. The 1458, for example contains two 741 type op amps. Often op amps require a bipolar power supply—that is, one which has both (+) and (-) supply voltages. Since the game paddle connector has only +5V available and the ADC0804 can be attached directly to the computer's data bus, the peripheral slot connector is the most reasonable place to attach the interface.

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Circle 5 on Reader Service Card

At first we were apprehensive about using the peripheral slot connector. We were not anxious to have a smoking Apple as the result of a fatal wiring error. The necessity of testing the newly wired interface card outside the computer was, therefore, a must. The problem of testing the card requires a method of reading the digital data from the converter without the computer. If this could be done with only a multimeter, we would not have the additional expense and inconvenience of obtaining an oscilloscope. To solve this problem we decided to use 9 light emitting diodes (LEDs), one diode for each data bit and one for the converter's ready line. To test the converter the input voltage can be read from a multimeter while the digital output can be observed by the condition of the LEDs. A +5V power supply is required to test the converter. Supply voltages of -12 and +12 are also required to test any additional op amp circuits. Flashlight cells can serve as the source of the analog test voltage. If a 5V supply is not available, it is possible to use the 5V and ground from the game paddle connector. We have accidentally shorted the Apple power supply from the game paddle without disaster. The +12 -12V supply voltages values are not critical. Any bipolar supply voltage from 10 to 18 V can be used for testing the op amp circuits. We do not recommend flashlight cells for the +5V supply. The internal resistance of the cells may be so high that the reference voltage supplied to pin 9 of the converter will contain a significant error. Furthermore, for the LEDs to light under battery power, each resistor in series with a LED must be reduced to about 300 ohms. This low resistance would allow about 10 times as much current to be drained from the Apple's power supply should the test circuit be accidentally activated when the card is in the computer.

The key component of the interface is an ADC0804 produced by National Semiconductor Corp. National Semiconductor Corp produces five, pin-for-pin compatible 8-bit A/D converters: ADC0801, ADC0802, ADC0803, ADC0804, ADC0805. Any of these converters may be used. They are CMOS 8-bit successive approximation A/D converters which use a potentiometric differential ladder. Radio Shack used to stock the ADC 0801. Some stores may still have a few left. The board we constructed uses the ADC 0804. The difference between the 804 and the 801 is that the 801 is rated to be slightly more accurate and has a wider temperature operating range. The price of the 801 is much more ($17). All of the converters have built in tri-state buffer data latches and an internal clock reference signal. As a further convenience, the construction of these ADC circuits allows them to work in the Apple with no additional circuits for address decoding. The DEVICE SELECT line from the computer is all that is needed both to start the conversion and to read the data.

The internal clock reference signal of the converter is used in conjunction with an external resistor and capacitor to adjust the clock frequency to the converter. The optimal frequency is 640 khz, which results in a conversion time of 100 μ sec. This is faster than an Applesoft BASIC program can successively PEEK the data location from the converter. Therefore, no delay loop in the BASIC program is required to read the data.

In the simplest interface design, the ADC080X will accept a maximum $V+_{in}$ signal of +5V. The $V_{ref/2}$ is set to 2.5V by tapping off the center of a 20k potentiometer or off the connection between two 10k resistors (R1 and R2 in Figure 2) which are connected between +5V and ground. The analog signal is connected between V M + and ground. The $\overline{CS}$ $\overline{RD}$ and $\overline{WR}$ (Chip Select, Read, and Write) pins of the converter are tied to pin 41 $\overline{DEVICE\ SELECT}$ of the peripheral connector. The 8 data lines are tied directly to the 8 data lines on the computer. Pin 25 (+5V) and pin 26 (ground) are the only other lines on the peripheral connector that are used for attaching the converter. None of the address lines are used. To power the operational amplifiers, pin 50 (+12V) and pin 33 (-12V) are also used.

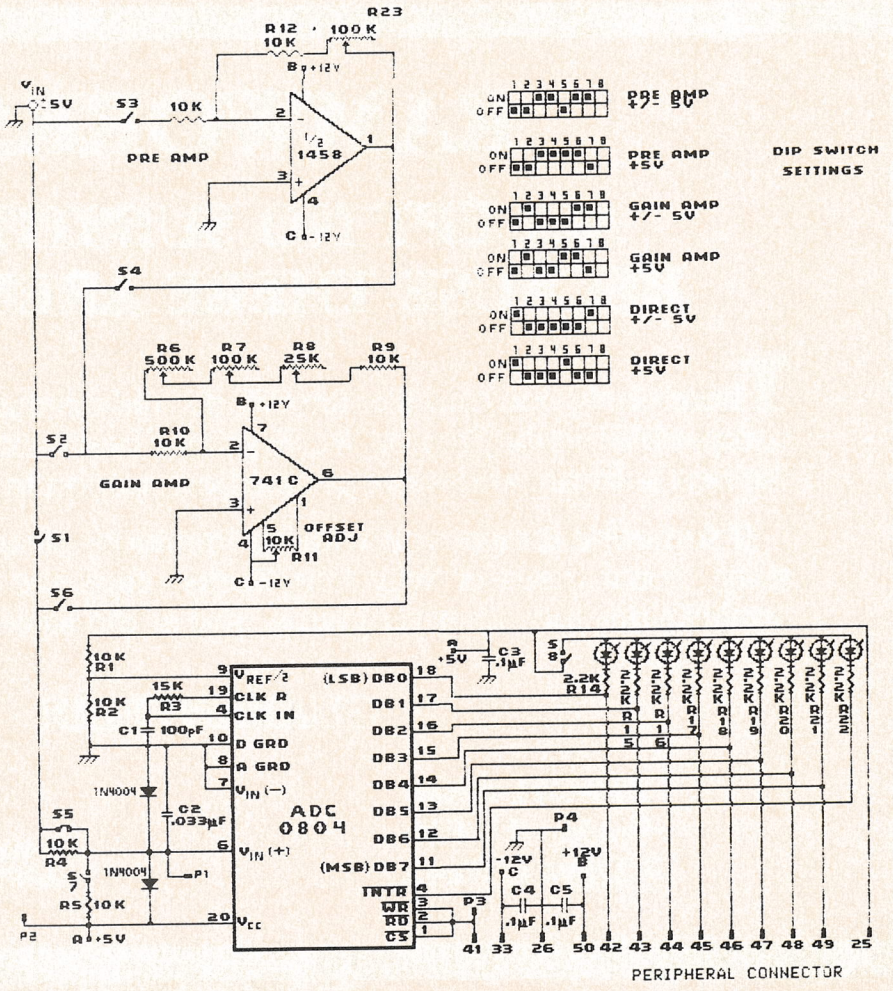
The components were mounted on an Apple II Hobby/Prototyping board, available at most local Apple dealers for $24. The board has the necessary contacts to fit directly into the Apple's peripheral slot. In addition it is prepunched so that standard DIP sockets can be easily affixed to the board. Each of the punched holes is coated with metal which makes soldering easy. We recommend using low profile sockets rather than wire wrap sockets in this board for two reasons. First, National Semiconductor specifically does not recommend wire wrap sockets for the ADC *, as they tend to pick up noise. Second, the wire wrap pins will stick out of the back of the card so far that another card can not be put into an adjacent slot in the computer. That is, if the ADC card is in slot 3, another card cannot fit in slot 2 because the wire wrap pins will protrude into this space. It also may be difficult to use slot 4 if the components on the front of the card stick out. By using low profile sockets both adjacent slots may be used.

Testing the Interface

Nine red LEDs, one for each data bit and

CIRCUIT DIAGRAM FOR 8 BIT A/D WITH ADJUSTABLE FULL SCALE RANGE FROM +/- 7.2 mV TO +/- 5 VOLTS

Figure 2



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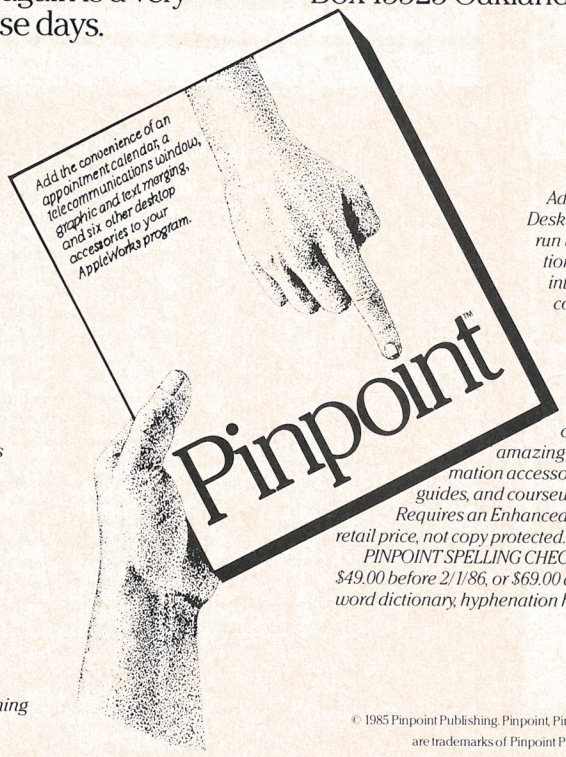
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one for the ready line, are wired into the card to test the operation of the ADC0804. The LEDs are only used for testing the ADC circuit. When the card is inserted into the computer, the LEDs are turned off so the card uses less power. One switch from the 8 position dip switch is reserved to activate and deactivate the LED test circuit. The remaining seven switches are used to select options associated with the op amps on the card.

The layout of the components on the prototyping board is shown in Figure 3. The top row of the card holds the dip switch and the 9 LEDs with their resistors. The 20 pin socket for the ADC is located at the far end of the next row. Placement of the .1uf decoupling capacitor (C3) for the +5V line is as near the V_{cc} pin as possible. Soldering these components along with the 100 pF clock capacitor (C1), the accompanying 15k resistor (R3), and the two resistors from pin 9 (R1 and R2) completes the basic 5V analog to digital converter circuit on the board. The remainder of the components shown on Figure 2 are used to allow the ADC0804 to convert bipolar voltages and to otherwise amplify the signal coming from the laboratory device. The function of these components will be described next time.

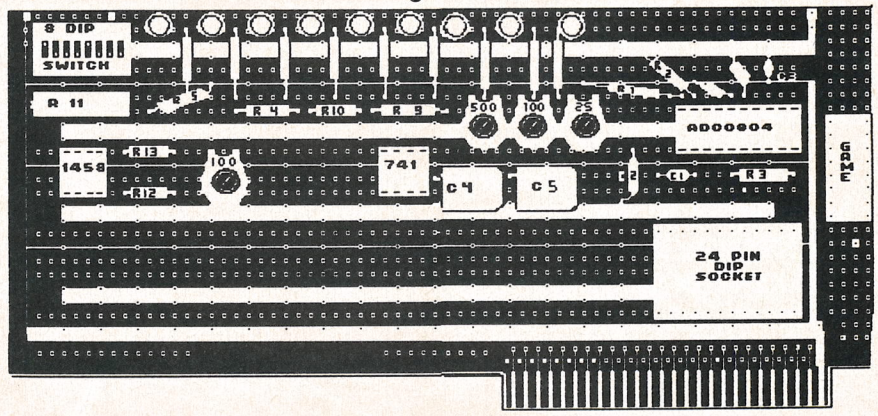
The newly wired ADC circuit may be tested for continuity and shorts using a resistance test with a multimeter. Make certain that there are no shorts between unused pins along the edge of the peripheral connector. If the wiring is satisfactory, the ADC0804 may be inserted into the card. To test the ADC without the computer, an external +5V power supply must be attached. To do this easily, solder a piece of resistor trimming or wire wrap pin onto the 5V and ground strips near the top of the card. The power supply leads may then be attached to these pins with alligator clips. Use a flashlight cell (1.5 V) as the source of the analog test voltage. The test voltage is connected between ground and pin 6 ($V_{in}+$) of the ADC0804. To simulate the operation of the DEVICE SELECT line, attach an extra wire to the line coming from pin 41 of the peripheral slot connector. This wire is shown as P3 on Figure 2. Operation of the computer is simulated by touching this wire alternately first to the +5V strip and then to the ground strip on the card. When this wire is touched to +5V, only the LED tied to the INTR on the ADC should light; when this wire is touched to ground, the data LEDs should light. If the test voltage is 0 (the analog leads shorted), all the data LEDs should light. Use of the cell gives an intermediate value. After this test is successful, the card may be tested in the computer.

For testing in the computer, the extra wire to pin 41 should be removed and dip switch 8 (S8) opened so that the LEDs on the card will no longer be connected. The DEVICE SELECT line is normally high and goes low whenever the address bus carries $C0MX, where $M is 8 plus the peripheral slot connector number. For slot 4, $M = $4 + $8 = $C. The instruction LDA $C0C0 or in Applesoft PRINT PEEK (49280 + 16 * 4) will activate the converter. If the card is in slot 5, data will be read by PRINT PEEK(49280 + 16 * 5) or LDA $C0D0. With one flashlight cell as the analog source, my computer printed 80. With two cells the computer printed 160, and with three cells, 240. The numbers depend on the value of V_{cc} and the values of the resistors attached to pin 9 of the ADC. The important thing is that the value returned doubles with two cells and triples with three.

In the next part, we shall describe the circuitry necessary to allow the converter to read currents and accept voltage ranges other than (0 to +5V).

LAYOUT OF COMPONENTS ON PROTOTYPING BOARD

Figure 3



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	1	EA	.99	.99	276-038	1458 DUAL OP AMP
	1	EA	1.99	1.99	275-1301	8-POSITION DIP SWITCH
	1	PK 2	.59	.59	276-1995	8 PIN LOW PROFILE SOCKET
	1	PK(20)	1.98	1.98	276-1622	ASSORTED LEDS (20)
	1	EA	.59	.59	276-1991	20 PIN LOW PROFILE DIP SOCKET
R14-R22	2	PK 5	.39	.78	271-1325	2.2K OHM RESISTOR 1/4 WATT
R1,R2	1	PK 2	.29	.29	271-155	10K OHM RESISTOR 1 WATT
R4,5,9,10,12,13	4	EA	.19	.76	271-034	10 K OHM RESISTOR 1/2 WATT
R3	1	PK 2	.19	.19	271-036	15K OHM RESISTOR 1/2 WATT
R11	1	EA	1.49	1.49	271-343	10K MULTITURN POTENTIOMETER
R8	1	EA	.49	.49	271-336	25 K OHM PC POTENTIOMETER 1/8 WATT
R23,R7	2	EA	.49	.98	271-338	100 K OHM MINI PC POTENTIOMETER
R6	1	EA	.49	.49	271-339	500 K OHM PC POTENTIOMETER 1/8 WATT
C3	1	EA	.49	.49	272-1432A	.1 MFD TANTALUM CAPACITIOR
C4,C5	1	PK 2	.79	.79	272-1069	.1 MFD PC CAPACITORS
C1	1	EA	.69	.69	272-152	100 pF CERAMIC CAPACITOR
C2	1	PK 100	1.98	1.98	272-801	ASSORTED DISC CAPACITORS (FILTER)
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Circle 46 on Reader Service Card

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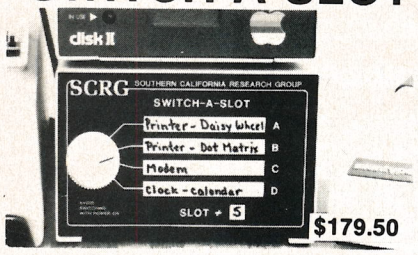

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The **SWITCH-A-SLOT** is an expansion chassis, which allows the user to plug in up to four peripheral cards in one slot. One of these cards is selected for use, and *only* that card draws power.

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SWITCH-A-SLOT and **EXTEND-A-SLOT** work well with most slow to medium speed cards, such as modems, printers, clock, music, etc. They are not recommended for high speed data transfer devices such as disk drive controllers, alternate processor, and memory cards.
Due to the nature of these products, and unit-to-unit variations of computers and peripherals, we are unable to guarantee that these products will work with any particular system. However, as with all our products, we offer a ten-day trial period. If our product does not operate to your satisfaction, return it for a prompt refund.

EXTEND-A-SLOT

The **EXTEND-A-SLOT** brings a slot outside your APPLE™, allowing an easy change of cards. The 18" (45cm) cable is long enough to allow placement of the card in a convenient location. the high quality connectors are gold plated for reliability. **$34.95**

SLOT 3 CLOCK™

Designed by Chuck Shaffer

The **SLOT 3 CLOCK** will plug into any slot of the APPLE][,][+, or //e. The main feature is that, unlike most cards, it can plug into slot 3 of the *//e without interfering* with the operation of the Extended 80-column card. **PRODOS**™ is fully supported, and the card is APPLESOFT™ compatible. Installation software and a long-life DURACELL™ lithium battery are included.

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PROmGRAMER™

Hardware design by Bob Brice — Software by Bob Sander-Cederlof

The PROmGRAMER is an inexpensive **EPROM** (**E**rasable **P**rogrammable **R**ead **O**nly **M**emory) programmer for the **APPLE**][,][+, and //e computers. The unit plugs into any slot of the computer, and allows the user to program any standard 5 volt, 27 series **EPROM**. Although not intended as a production tool, the ease of use allows rapid programming, copying, duplication, or modification of **EPROM**s.

$179.50

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The **PADDLE-ADAPPLE** is a game plug expansion adapter that plugs into the interior game I/O socket, and is designed to operate in one of two modes. In the first, it allows you select between one of two devices, such as Koala Pad™ and joystick. The device is selected by the flip of a switch. In the second mode, the **PADDLE-ADAPPLE**, with appropriate software, allows the use of two joysticks simultaneously to allow use with games such as **ONE-ON-ONE**™ and **ARCHON**™.

There are three versions to adapt to any combination of the newer type APPLE connector (the 9-pin 'D' sub-miniature), or the older 16-pin plug.

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- The **PADDLE-ADAPPLE COMBO** has one 'D' subminiature and one 16-pin connector.
- The **PADDLE-ADAPPLE 'D'** has two subminiature 'D' (9-pin) connectors.

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9-16 Adapter
for APPLE //e & //c

The 9-16 adapter permits the use of most 16-pin I/O devices with the APPLE //e or //c. Plugging this adapter into the subminiature 'D' connector allows the use of 16-pin device, such as the **PADDLE-ADAPPLE**, paddles, joystick, 16 pin Koala Pad™, etc. The only limitations are those devices that use the annunciators or the $CØ4Ø strobe. **NOTE**–the //c does not support two joysticks. **$14.95**

16-9 Adapter
for APPLE][and][+

With this adapter, owners of early APPLEs can take advantage of the newer 9-pin game products, such as paddles, joysticks, **MUPPET LEARNING KEYS**™, etc. **NOTE** – If you have more than one game I/O device, consider purchasing our **PADDLE-ADAPPLE COMBO** or **PADDLE-ADAPPLE 'D'** instead. **$14.95**

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Inverse Catalog Printer

Val J. Golding

HOW many times have you turned your printer on, typed "CATALOG" and had your printer go bananas, spewing out reams of paper, changing type styles, or just generally misbehaving?

The common cause for this frustrating behavior is inverse or flashing characters in dummy catalog titles. In fact, because they look "pretty," many A.P.P.L.E. products come this way, and of course you can create your own with programs such as *Directory Title Writer.*

So here is a simple utility that provides a solution. It is offered here in two forms: as a *Big Mac* source listing, for those who may want to modify it (trap out backspaces?), and as a BASIC program, using the *Lam* subroutine to place it in memory.

It will work equally well with or without your printer on, but it must be re-initialized each time after you execute a **PR#** or **IN#** command. For normal use, let's assume you have RUN the BASIC program, or that it has already been BLOADed or BRUN, and is present in memory. Just turn your printer on, type **CALL 734**, and catalog your diskettes.

```
]LIST

10  REM

    INVERSE CATALOG PRINTER

VAL J GOLDING : CALL -A.P.P.L.E.

100 HEX$ = "2DE:AD 53 AA 85 0 AD
     54 AA 85 1 A9 F3 8D 53 AA A9
      2 8D 54 AA 60 C9 80 B0 6 29
      3F 69 20 49 E0 6C 0 0 N D9C
     66"
110  FOR I = 1 TO  LEN (HEX$): POKE
     511 + I, ASC ( MID$ (HEX$,I)
     ) + 128: NEXT : POKE 72,0: CALL
      - 144
200  REM

RUN THIS PROGRAM, THEN TURN ON
PRINTER AND CALL 734. AFTER
EACH PR# OR IN# COMMAND,
ISSUE A NEW CALL 734
```

```
                        ********************************
 2                      *                              *
 3                      *  Inverse Catalog Printer     *
 4                      *                              *
 5                      *     by Val J. Golding        *
 6                      *                              *
 7                      *     Call  -A.P.P.L.E.        *
 8                      *                              *
                        ********************************
10                      *                              *
11                      * BRUN to initialize. Any PR#  *
12                      * or IN# command disconnects;  *
13                      * CALL 734 to reconnect.  This *
14                      * will convert any INVERSE or  *
15                      * FLASH characters in the      *
16                      * catalog to NORMAL.           *
17                      *                              *
                        ********************************
19
20
21                      DOSCSWL  =   $AA53
22                      PRTVEC   =   $0000
23
24                      *
25                              ORG  $02DE      ;Keep page 3 free
26                      *
27
02DE: AD 53 AA          28      INIT    LDA  DOSCSWL    ;Get address of printer
02E1: 85 00             29              STA  $00        ; card warm start from DOS
02E3: AD 54 AA          30              LDA  DOSCSWL+1  ; and save it so we can
02E6: 85 01             31              STA  $01        ; find our way back.
                        32      *
02E8: A9 F3             33              LDA  #<START    ;Now stuff the address
02EA: 8D 53 AA          34              STA  DOSCSWL    ; of our routine back, and
02ED: A9 02             35              LDA  #>START    ; DOS is none the wiser.
02EF: 8D 54 AA          36              STA  DOSCSWL+1
02F2: 60                37              RTS
                        38      *
02F3: C9 80             39      START   CMP  #$80
02F5: B0 06             40              BCS  PRINT
02F7: 29 3F             41              AND  #$3F
02F9: 69 20             42              ADC  #$20
02FB: 49 E0             43              EOR  #$E0
02FD: 6C 00 00          44      PRINT   JMP  (PRTVEC)


--End assembly, 34 bytes, Errors: 0
```

Review of "Blankenship BASIC"

Stein Goering

Product: Blankenship BASIC
Use: Programming Language
For: Apple II+, IIe, IIc
Company: Blankenship & Associates
P.O. Box 47934
Atlanta, GA 30362
Price: $25—either DOS 3.3 or ProDOS version
$39.95—both versions
Plus $2.00 Postage

As a college instructor of computer science, I don't hear good words said about BASIC. A standard complaint among many of my colleagues is that they often have to make beginning programming students unlearn the bad habits they got from early exposure to the language. If we could make it illegal to teach BASIC in high schools, we'd probably do so.

However, even academicians are forced to deal with the real world at times. For example, I also teach a general education course called Computer Literacy, which has the stated purpose of providing computer usage skills to as wide a range of people as possible. We want to give the students some programming exposure and, like it or not, BASIC is the one language that most people have access to. So we devote part of the course to BASIC programming.

Learning Unstructured Methods

Students in this course do their lab work on our Apple *//e*'s, which has meant working with Applesoft—a BASIC dialect that seems to bring out the worst features of the language. For starters, the poor novice user is distracted from the programming process by having to deal with an atrocious screen editor, a convoluted method of accessing files from within programs, and poor output fomatting capabilities. What's worse, the complete lack of WHILE or ELSE commands and the inability to name subroutines (except by line number), make it very hard to apply modular or structured methods of programming. So my students often end up learning the same old unstructured methods that I try so hard to discourage in my formal programming courses. A few students do go on to take advanced courses, and it is embarrassing to tell them to forget what they learned in my course last semester. Even those who just want to write programs for their own use had learned to produce "spaghetti code" that was more complicated than it should have been.

Solving Applesoft's Drawbacks

When I read an ad in *Call -A.P.P.L.E.* last spring about a version of BASIC that claimed to solve most of Applesoft's drawbacks, I was intrigued but skeptical. Yet the price was right, so I took a chance and was not disappointed. Blankenship BASIC is a truly outstanding piece of software, and an incredible bargain at $25. The package includes a BBASIC system disk (in either DOS 3.3 or ProDOS format), a 12-page documentation booklet, and a user's license. Also, the program is distributed via the shareware method, which means that if you get a copy of the program disk from a friend, you can get the documentation and a legitimate license from Blankenship Associates for only $12.50.

The system disk contains two versions of the BBASIC language, a utility for installing BBASIC on your own disk, a documentation file, and some sample programs. Booting up with a BBASIC disk will allow you to load into memory either the hi-res graphics or maximum memory version. BBASIC occupies only 8K of memory and is loaded below the program area, which means that additional machine language extensions can be loaded into the traditional memory space below DOS if needed.

You may not need anything else. BBASIC features a built-in editor that greatly facilitates entering and changing program lines, as well as limited autonumber and renumbering capabilities. The LIST command now displays programs in a much improved format, and there's a LLIST command for getting a printed listing (no more ctrl-I 80N hocus pocus). There's also a fast RENUM command.

The Modular Approach

In addition to a greatly improved programming environment, BBASIC also duplicates most of the common ampersand extensions to Applesoft, such as PRINT.USING, SWAP, INPUT anything, array SORT and SEARCH, and SOUND. There are also ELSE, WHILE and REPEAT commands, which begin to make structured programming feasible. The DISK command replaces Applesoft's awkward CHR$(4) usage, and the graphics version features BOX, BOXFILL, and a rather nifty DRAW.USING statement. All these extensions are hooked into the native Applesoft interpreter by

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means of the ampersand command; however, BBASIC programs are not cluttered up with obscure looking "&" statements. The BBASIC editor neatly interprets the listing so that you can type in the extended commands just like you would standard Applesoft syntax.

The modular approach to solving problems involves breaking big problems down into smaller ones, repeating the process until the components are small and simple enough to handle easily. Modular programming is known to be an effective technique, but it is not easily applied in standard BASIC. BBASIC, on the other hand, encourages modularity by giving the programmer the ability to define procedures that can accomplish specific and relatively simple tasks. These can then be called from the main program (or from another procedure) when needed, using the PERFORM command. The FILE command allows you to store your most used procedures in disk libraries; you can then use MERGE to include them easily in future programs.

Customer Support

In addition to a fine product, Blankenship Associates offers excellent customer support. Registered users can get updates to BBASIC for $5, and are entitled to a free subscription to the semi-regular BBASIC newsletter. The newsletter reports any bugs found, gives information on available utilities, and provides hints and programming tips. It also serves as a forum for Mr. Blankenship to respond to questions that users send in. To get the newsletter, provide Mr. Blankenship with SASEs so he can send you issues as they come out.

Furthermore, any registered owners who wish to market software written in BBASIC may distribute system disks along with their programs at no additional charge. They need only follow the reasonable guidelines so that their documentation provides credit and advertising for BBASIC

A Few Problems

Of course, nothing's perfect, and BBASIC does have a few drawbacks. Variable names are still restricted to two significant characters, and we're limited to the same old data types: integers, reals, strings, and arrays. There is also no provision for formal parameter passing (i.e. you can define procedures, but can't specify that they have inputs and/or outputs). These are basically limitations inherent to Applesoft which even John Blankenship, BBASIC's talented author, couldn't overcome (at least, not while limiting his code size to 8K).

The only real complaints I have are relatively minor points. The BBASIC editor is permanently in insert mode, which means that if you make a typing error, you can't type over it. You have to delete the error, then type in the correction. You can delete characters with either the ctrl-Z, ctrl-P, or the //e's Delete key, but they all delete the character to the left of the cursor, not the one under it. I've found that system to make error correction awkward for some people who are used to working with the Apple's regular input routines and/or word processors that use overstrike as the default mode.

The editor, which is always active, can sometimes exhibit a few annoying habits, since it is continually printing the contents of the edit buffer to keep the display updated. This works fine most of the time, but can result in uncontrollable scrolling if you try to edit a full line at the bottom of the screen. The continual updating also means that you may get unwanted output sent to your printer should you issue a PR#1 command from immediate mode. I always find that a few students have run up against this problem, judging by the garbage that gets mixed in with the program listings and output they hand in.

Conclusion

Minor complaints notwithstanding, Blankenship BASIC is a remarkable programming achievement. Not only does this product fill a real need, but its reasonable price and distribution policies make it accessible to all Apple users. Listing 1 is a short program I wrote to demonstrate some of the features of the language.

Listing 1

```
1000  REM       ASCII TABLE PROGRAM    by Stein Goering
1010  REM Demonstrates a few features of BLANKENSHIP BASIC
1020  REM
1030  REM  MAIN PROGRAM
1040  REM  The COMPILE command must appear before
            the first PERFORM
1050  REM  It creates a table of module addresses
1060  COMPILE
1070  PERFORM "INIT.STUFF"
1080  HOME : VTAB 6
1090  PRINT "TYPE [CTRL-P] TO GET HARDCOPY PRINTOUT"
1100  PRINT "ANY OTHER KEY GIVES SCREEN OUTPUT ONLY"
1110  GET KEY$
1120  REM Using DISK allows DOS commands without CHR$(4)
1130  WHEN KEY$ =  CHR$ (16) THEN
1140    DISK "PR#1"
1150  ENDWHEN
1160  PRINT
1170  PERFORM "PRINT.HEADINGS"
1180  FOR N = 1 TO 127
1190    PERFORM "PRINT.CHARACTER"
1200    PRINT.USING "       ";N;
1210    PRINT  SPC( 3)
1220    PERFORM "PRINT.BINARY"
1230    PRINT  SPC( 3);
1240    PERFORM "PRINT.HEX"
1250    PRINT
1260  NEXT N
1270  END
1280  REM  Module definitions follow:

1290  DEFINE "INIT.STUFF"
1300    DEF  FN ODD(X) = (X / 2 <  >  INT (X / 2))
1310    REM Using RESTORE.HERE allows each procedure
1320    REM  to have its own DATA statements
1330    RESTORE.HERE
1340    DATA 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
1350    DIM HEX$(15)
1360    DEF  FN DIV16(X) =  INT (X / 16)
1370    DEF  FN MOD16(X) = X - 16 *  INT (X / 16)
1380    FOR DIGIT = 0 TO 15
1390      READ HEX$(DIGIT)
1400    NEXT DIGIT
1410  FINISH

1420  DEFINE "PRINT.HEADINGS"
1430    PRINT "  TABLE OF THE ASCII CODES"
1440    PRINT " CHAR     DEC    BINARY    HEX"
1450  FINISH
1460  DEFINE "PRINT.CHARACTER"
1470    WHEN N = 27 THEN
1480      PRINT  SPC( 3);"ESC";
1490    ELSE
1500      WHEN N = 32 THEN
1510        PRINT " SPACE";
1520      ELSE
1530        WHEN N = 127 THEN
1540          PRINT  SPC( 3);"DEL";
1550        ELSE
1560          WHEN N < 32 THEN
1570            PRINT "CTRL-";
1580            PRINT  CHR$ (N + 64);
1590          ELSE
1600            PRINT  SPC( 5); CHR$ (N);
1610          ENDWHEN
1620        ENDWHEN
1630      ENDWHEN
1640    ENDWHEN
1650  FINISH

1660  DEFINE "PRINT.BINARY"
1670    LET NUM = N
1680    LET PLACE = 8
1690    LET BIN$ = ""
1700    WHILE NUM > 0
1710      LET BIN$ =  STR$ ( FN ODD(NUM)) + BIN$
1720      LET PLACE = PLACE - 1
1730      LET NUM =  INT (NUM / 2)
1740    ENDWHILE
1750    FOR I = 1 TO PLACE
1760      PRINT "0";
1770    NEXT I
1780    PRINT BIN$;
1790  FINISH

1800  DEFINE "PRINT.HEX"
1810    PRINT HEX$( FN DIV16(N));
1820    PRINT HEX$( FN MOD16(N));
1830  FINISH
1840  REM
1850  REM Sample output line:
1860  REM     M     78    01001101    4D
```


FINALLY!

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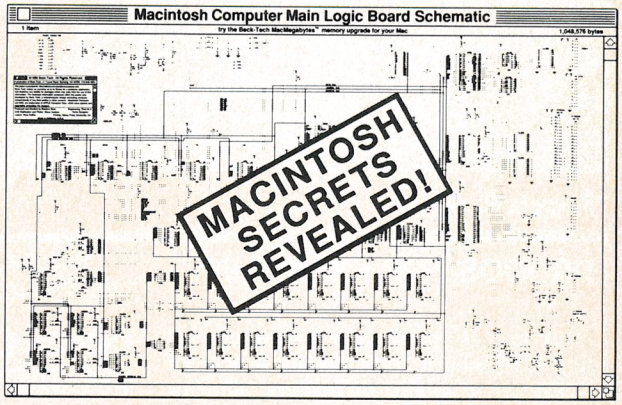

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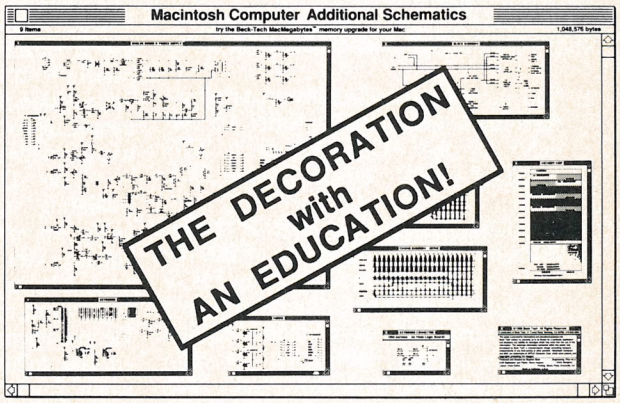

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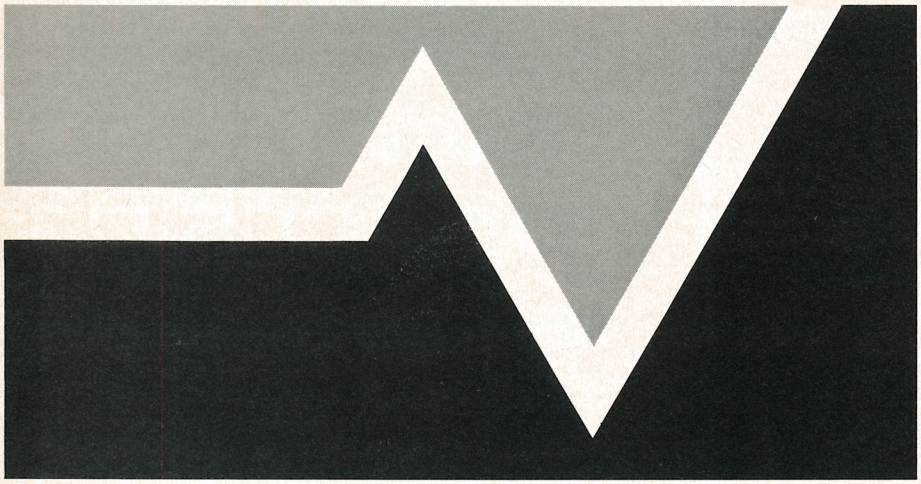


Bruce F. Field

PRODOS FOR FRANKLIN

A few columns back I reported that Larry Washburn could supply a new F8 ROM for Franklin computers allowing them to run ProDOS. Unfortunately, Larry is no longer able to sell these ROMs, but he has sent along a tech sheet on how to modify your F8 ROM to make it ProDOS compatible. I have included his instructions here.

1. You must have the ability to program EPROM's, either a 2716 (Intel +5 volt only) for the ACE 1000 or a 2732 EPROM (or 'A' version) for the ACE 1200.
2. ProDOS upon booting, looks at the F8 (Monitor) ROM at location hex FB09 the start of the Title used. See page 144 of the Apple II Reference Manual. All eight characters must be in place utilizing those hex codes. (BFF note: The eight codes are $C1, $D0, $D0, $CC, $C5, $A0, $DD, $DB, and spell 'APPLE][+'.)
3. Copy the Franklin F8 Monitor ROM into RAM and then, using the monitor, change the eight values to the new values at location $309 plus the starting address of your RAM address where you loaded the copy of the ROM. Use the patched code to burn a new F8 EPROM.
4. Insert the new F8 EPROM into the motherboard and then try to boot ProDOS.

This completes the modification.

EPROM programmers can be purchased (about $65-$100) to plug into Apple compatible computers. Check the back of many magazines and the Computer Shopper newspaper. EPROM's can also be purchased from the same companies generally for about $4-5 for a 2716 and $4-9 for a 2732A. Access time of the EPROMs should be rated at 450 nanoseconds or less."

Thanks for sharing your information with us Larry.

CONSOLIDATING SPREADSHEETS

I have had a couple of people write to provide a better answer to a question on consolidating spreadsheets using AppleWorks. I apologize for my answer stating that it wasn't possible. I am not terribly experienced in using AppleWorks and got my information second hand from a couple of people. However, Dr. George LaCroix has written with a very complete answer.

"I noted your answer regarding consolidating several spreadsheets into one using AppleWorks. While your answer is correct you cannot consolidate several spreadsheets into one automatically, there is a way of moving spreadsheets from one file into another spreadsheet file. I have used the following technique on occasion when I wish to cross reference related spreadsheets in the same file. The technique I use is to set the spreadsheets for manual calculation, copy them to the clipboard, and then copy them to the spreadsheet file that I wish to consolidate. If the column widths are the same in both spreadsheets, you can copy directly beneath the first spreadsheet, thus having the two close to each other for viewing. If, however, you wish to have the freedom of altering the number of rows or columns, then what I do with the spreadsheet to be moved is to insert a number of columns so that when consolidated it is diagonally lower and to the right. This permits freedom with column and row manipulation. I have, however, found easier manipulation in keeping related spreadsheet files in a subdirectory and take the time to load those that are related to the desktop. I personally prefer smaller spreadsheets to the larger consolidated ones."

SIMULATE A SHIFT KEY MOD

Steve Meuse has written to explain how to simulate a shift key mod on a //e so that word processors designed for the II or II+ can be used. According to Apple's *Technical Overview of the e Developer* mailing:

"The shift key mod may be duplicated by soldering a 500 ohm resistor across the logic board connector at X6. **Note:** *The warranty is voided by doing this."* Steve adds that he has seen in letters elsewhere that the 500 ohm resistor is not needed, and that a drop of solder will do fine.

Steve also warns readers not to press Control-Open and Closed Apple-Reset on //c's with external drives as the disk in that drive will have a track erased. This doesn't make a lot of sense, since pressing Control-Open and Closed Apple-Reset on an enhanced //e only runs the system diagnostic program. Perhaps the problem only occurs on a //c if you are writing to a disk when the combination is pressed. In any case consider yourself forwarned.

KEEPING THE RESET KEY ON

Q. *I have the Buffered Grappler+ and a Keytronic KB200 keyboard for my Apple II+. In normal operation (i.e. text and graphics) the combination doesn't have any problem. My problem occurs when I wish to clear the buffer. The Grappler manual says to press and hold the reset key down for two seconds. However, on the Keytronic keyboard the reset doesn't stay on. I suspect that, unlike the Apple keyboard, the grounding of the reset key is not allowed to remain in the reset position. Consequently, I am unable to clear the buffer and the unwanted printing continues. So, my question is: can I modify my Apple (by adding an external switch) so that the reset key stays on? If so, how?*

A. There are a couple of ways. The least destructive is to buy an Apple prototyping card that plugs into one of the Apple slots. At the bottom of this card are numbered fingers that plug into the connector in the Apple. Connect a normally open pushbutton switch (a Radio Shack #275-1547, or #275-1572 will do) between number 26 and number 31 on the card. The prototyping card is theoretically available from Apple dealers, but may be hard to find. It is also available from JDR Microdevices for $15.15 (part number P500-1). JDR's toll free number is 800-538-5000, or in CA 800-662-6279. The disadvantage of this method is that it uses a slot.

Another solution is to attach a switch to the keyboard connector on the Apple motherboard. The cable from the keyboad plugs into a 16 pin connector at the front of the motherboard. If you attach very fine wires to the pushbutton switch (#30 wire wrap wire works well), you can slip these into the holes in the connector and also plug in

the connector from the keyboard. You want to connect the new pushbutton switch between pins 3 and 8. The connector is numbered starting in the lower right hand corner as you face the computer, and continues back along the right side. Thus, pin 3 is the third pin from the front on the right hand side, and pin 8 is the last pin in the back on the right hand side. This method is somewhat less reliable than the first if you wiggle or pull on the wires.

WELCOME TO THE TWILIGHT ZONE

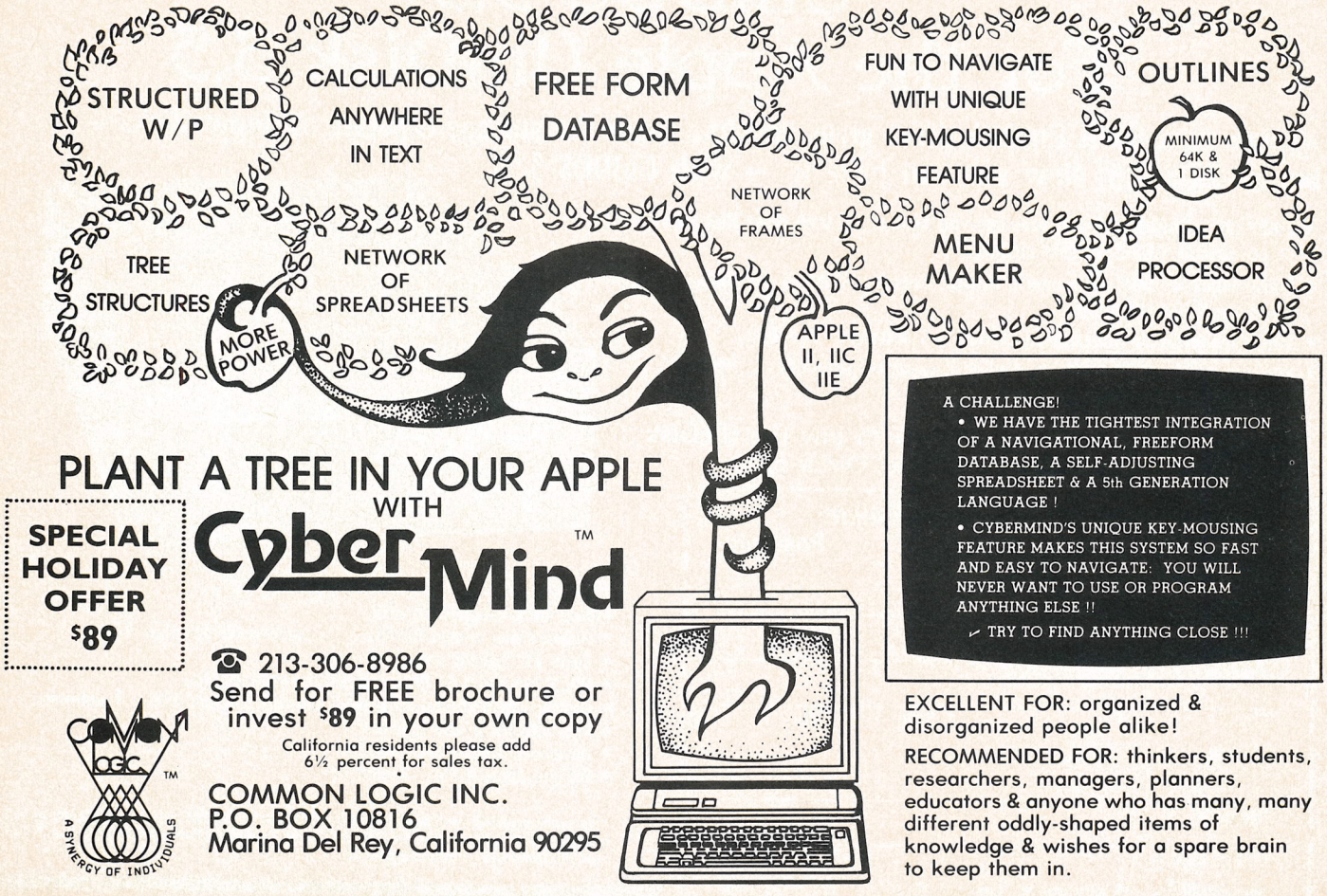
Q. *The letter in your column about the fast garbage collection routine which appeared in* Call -A.P.P.L.E. In Depth, Volume 1, All About Applesoft, *prompted me to get around to assembling it, which I did according to your suggestion of JMP NZTAB. It does collect garbage FAST. There seems to be another bug, however, in the first routine which decides whether or not to collect. Shouldn't line 55 read "SBC STREND + 1" so you're comparing the two high bytes? I incorporated the new garbage routine into a BASIC program which reads lengthy files from disk and sorts through them with string routines. I temporarily put a line in the program so I could watch program free space after each string is processed. I also injected "JSR $FF3A" after line 59 of the assembly listing of the fast garbage routine. That way I get a beep whenever the fast garbage program passes its introductory decision and begins to collect. Until I changed line 55, it didn't. I'm not imagining all this am I?*

A. Welcome to the Twilight Zone. Actually you are correct, the introductory decision should compare the high byte of FRETOP (the end of numeric storage) to the high byte of STREND (the start of string storage). Otherwise it may not garbage collect when needed, or collect more often than needed. Thanks for pointing this out. For those who missed the original correction, the instruction JSR NZTAB at line 60 should be removed and a new instruction JMP NZTAB placed immediately before label FNDVAR2.

HANDLING LONG LINES

Q. *My current puzzle is about Applesoft BASIC keyword token editing. Do you know of any editors that can deal with Applesoft on a token level? The reason I ask is that I've received a recent update of The Data Factory from the quiet folks at MicroLab. They haven't answered any of the several letters I've written, but they did process my annual $30.00 warranty extension payment. Their latest version is written in copyable BASIC but with some very long lines of compressed code. The programs will list but can't be worked with. The A.P.E. I recently received from A.P.P.L.E. Co-op won't handle the "long" lines. Neither will GPLE, Apple Tool Kit or Big Edit. EXECing the representative text file after looking at it with Applewriter II just chokes the Apple.*

A. I have not used a program that allows one to create "long" Applesoft lines, but a friend of mine thinks that "ProCmd" will do it. (Notice how I absolve myself from any responsibility here.) ProCmd is available from the author, Glen E. Bredon, 521 State Road, Princeton, NJ 08540, for $20. However, I suspect that the original program was written with short lines and then the tokenized program "compressed" to create long lines. If ProCmd doesn't work, I think you are on the right track by "listing" the program to a text file and editing it with Applewriter II. Before you can EXEC it back, you must shorten all the "long" lines. Each line must be less than 242 (244? something like that I can't remember exactly) bytes long. Each BASIC keyword takes one byte, and each character or space takes a byte. Remove the colon separating the statements and insert a carriage return and a new consecutive line number in the middle of the long line to break it into acceptably shorter parts. You must watch out for IF statements. If the IF equates true, then all the statements on the line after the THEN are executed; otherwise the first statement on the next line is executed. You may need to add some GOTOs if you break up IF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Circle 15 on Reader Service Card

statements. This can be tedious to do by hand. Except for the IF statement part, it is fairly easy to write an Applesoft program to scan a text file and break lines at colons when they are over a certain length. Good luck.

REPLACE $A000 WITH NOPs

Q. *I am converting a number of Visicalc files to SuperCalc 3 and have to convert them from DOS 3.3 to ProDOS. The problem is that Visicalc allows you to save spreadsheets with a number at the start of the filename and the ProDOS CONVERT program doesn't like this. Of course the DOS 3.3 RENAME command doesn't work either. Is there any way I can get DOS 3.3 to accept a number as the first character?*

A. The DOS 3.3 code checks for a number starting at $A048. The first character of the filename is in the accumulator at this point and the accumulator is then left shifted one bit. Then two tests are performed: BCC to $A050 and BMI to $A050, or a JMP to $A000 if both tests fail. If the first character is not a number or control character, the code at $A050 is executed. If it is not a legal character the program jumps to $A000. To defeat this, replace the jump to $A000 with NOPs, i.e. at $A04D through $A04F place $EA, $EA, $EA.

ADJUSTING PRINTER OUTPUT

Q. *I have used a Master Catalog program and enjoy the ability to develop a catalog of my files. However, the program is set to print on an Epson in condensed mode. I have an Apple Imagewriter and am trying to figure out how to modify the print commands to use condensed mode, make horizontal tabs work, and eliminate double spacing. I have had no luck. Can you help?*

A. Fixing the condensed mode is the easiest part. To get a printer to print in a special mode, i.e. condensed, the program must first turn the printer on with a statement such as "PR#1" and then print one or more special characters, that the printer interprets as commands, to change the print mode to what you want. Since the program already works with the Epson, all we have to do is find the print statement that prints the special condensed command to the Epson and change it to the one for the Imagewriter. The command for the Epson is CHR$(15). Somewhere in the program is a statement like PRINT CHR$(15) which sends the command to the printer. It may be part of another statement, or part of an IF statement, like IF A$="Y" THEN PRINT CHR$(15). You must change the CHR$(15) to CHR$(27);CHR$(81). If you look on the Imagewriter Reference card in the back of your Imagewriter User's Manual, you will see the codes needed to control the printer under the heading General Control Codes. If you are using an Applesoft program look at the column labeled 'Decimal' and use those numbers with the CHR$ function as I've done above.

Horizontal tabs and double line spacing are usually controlled by the printer interface card plugged into your Apple or the printer itself. If the program contains statements such as PRINT TAB(13), these should work correctly. When using a BASIC program, extra line feeds can be generated because the interface card is set to produce a line feed every time it sends out a carriage return *and* the printer is set to produce a line feed every time it receives a carriage return. A carriage return is just that, the print head is moved to the left of the carriage but no movement of the paper occurs. To get the paper to move up one line you will need to have the interface card *or* the printer generate a line feed, but not both. Generally it is preferable to have the interface card generate the line feed. Check the small DIP switches inside the printer. The one labeled SW1 should have the eighth switch open for no extra line feeds. This is often called Automatic Line Feed or Auto Line Feed.

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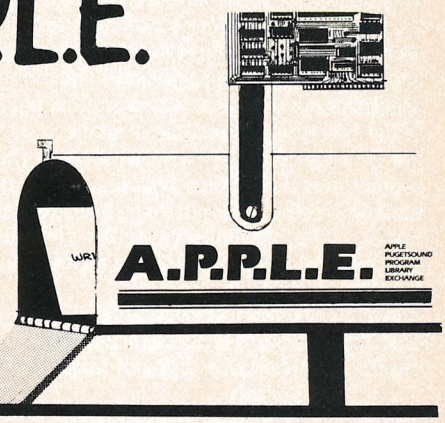
Write A.P.P.L.E.



Readers' forum

A Satisfied Apple Customer

I don't understand the experience of Ron Hesler in his letter published in the August 1985 issue of *Call-A.P.P.L.E.* I have sent one letter to Apple computer in Cupertino and got a quick and informative answer. That's not a broad base of experience, but then I've never had trouble with my Apple II No. 24090! I've had a completely positive experience with Apple Computer, Inc.

Thomas A. Nelson

Thanks for the Black Box

I want to thank you for the Macintips—A Black Box article in the June & July 85 *Call-A.P.P.L.E.* It gave me the courage to apply my limited electronics experience and knowledge to a most worthwhile project. At present, I have half constructed the box. I am using it to share the Imagewriter with my Mac and *//*e. I am using a Text Print Serial Interface card in the *//*e. I have not wired the modem switches because I do not have an external common modem yet. (However, I recently installed an internal In-Tec 300 modem in the *//*e).

I do have some questions and comments about the black box. Using my ohmmeter I traced my Mac/Imagewriter cable and noticed the following pin assignments:

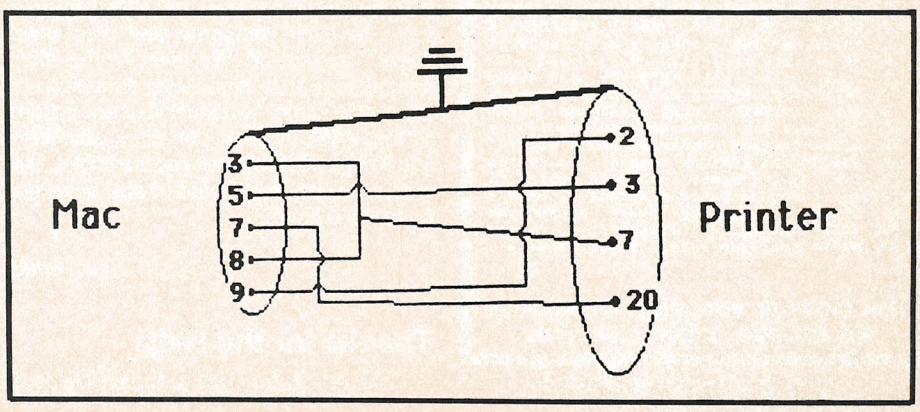
After doing this, I made the following observation: pin 1 was not used. Therefore, I did not wire the ground to pin 1 of black box DB25s. I made the unshielded cable leading from the black box to the printer the ground wire which I connected to the metal shield of the male plug going into the printer.

After looking at the Imagewriter manual, I noticed the following pin assignments:

Pin 1	Frame Ground
Pin 2	Send Data
Pin 3	Receive Data
Pin 4	Request to Send
Pin 7	Signal Ground
Pin 14	Fault
Pin 20	Data Terminal Ready

From the assignment of pins on the Mac/printer cable I concluded that the following Mac pins were assigned as follows:

Pins 3 & 8	Signal Ground to printer pin 7
Pin 5	Receive Data to printer pin 3
Pin 7	Data Terminal ready to printer pin 20
Pin 9	Send Data to printer pin 2



I couldn't help wonder what happened to pins 1, 4 and 14 on the printer. I also wondered if it was necessary to wire pin 4 in the black box unless the //e needed pin 4.

In trying to figure out the pin assignments in the cable to the modem from the black box, I ran into some confusion. It seemed like there were two wires going to one of the pins in the cable and I wanted to check this out with you. It appears that pin 2 of the box to modem cable is connected to pin 2 of the DB-9s. It is not clear if the center pin of the modem switch also goes to pin 2 or to some other pin in the box/modem cable. The pin assignments for the box/modem cable appear to be as follows:

Pin 2	To pin 2 on both DB-9s
Pin 3	To pin 3 on both DB-9s
Pin 5	To center right of large switch
Pin 6	To center left of large switch
Pin 7	To Frame Ground
Pin 9	To pin 9 on both DB-9's
Pin ?	To center and middle of large switch

Please let me know which pin in the modem/box cable is to be connected to the center and middle of the large modem switch. By the process of elimination, it most likely is either pin 1 or 4. Also, do I have the other pin assignments correct (i.e. is 7 really the frame ground or should it be the signal ground)?

I haven't done any file transfers between computers and now that I have a Mac and a //e I would like to port over to Mac documents that were created with Wordhandler and AppleWorks and convert those text documents into MacWrite documents. Are there any articles or books that could take me through a step by step process to accomplish the porting and converting to MacWrite documents?

I want to thank you again for your article and column.

John Earnest

The author responds:

Dear John:

Understand, I am not an expert on the pin assignments of the Macintosh—but I don't need to be for this box to work. All it does is switch between the *same* pins on different plugs. In other words, it doesn't really matter what pin 9 of the modem cables do. It is sufficient to know whether or not they are used, and if so, to switch between them.

Now to your questions: Pin 1 on the Imagewriter is *Frame Ground.* That is different than signal ground. It sounds like you have taken care of this with your cable shield wire. I really don't know about pins 4 and 14. I included pin 4 on the speculation that the //e would need it, and left out pin 14. My gamble apparently worked. You could try leaving out pin 4, and you might get away with it.

As far as the modem is concerned, again I don't care about specific pin assignments. What the modem switch does is switch between pins 9, 7 and 5. The upper left pin of the switch goes to pin 9, and through the porting switch, and the lower left pin of the modem switch to pin 9 on the lower DB-9. The upper and lower middle pins of the modem switch go to pins 7, and the upper and lower right pin to pin 5. The center pins of the switch go to pins 9, 7 and 5 respectively to the modem, and that's it.

As far as porting is concerned, do it just as you would when sending or receiving a file over the phone lines. In other words, with the porting switch "on" (you may need to turn on your modem), run a terminal program on each computer, and then select "Send" on one and "Receive" on the other, making sure that baud rates, data bits, etc. are set the same. You must send everything as text (ASCII) files, but since MacWrite and Microsoft Basic can read text files, that is no problem. You should be able to send at up to 9600 baud.

Ken Watters

Thanks for the Help

Thank you for putting the article about me in your column in the Sept. 1984 issue [*describing the special physical needs of a bright, young computer user–Ed.*] One of your readers sent me a hard disk drive. He is a nice man who lives in Oklahoma. That would not have happened without your help.

Now I don't have to bother my dad to insert my disk because I can keep all my programs on the hard disk.

Rodney Lewis

Installing ProDOS on the Sider Hard Disk

I have recently installed the Sider hard disk on my Apple //e system. I find it to be an excellent performer. I did encounter one problem that could present a problem for an inexperienced computer user.

The installation manual on page 22, explains how to install a version of ProDOS on the Sider in the ProDOS partition. ProDOS, however, is not loaded from the ProDOS partition. Listing 1 is a printout of the files on the Sider Installation diskette labeled Support Utilities for DOS 3.3. These are the files that are written into the DOS 3.3 partition at installation time. As you can see, ProDOS is a binary file residing in the DOS 3.3 partition where the system boots into. Listing 2 shows the portion of the main menu boot program that selects what function is to be run at bootup. Listing 3 shows that selecting function 4 BLOADs a binary 3.3 file of ProDOS.

In order to install my version of ProDOS 1.1.1, I had to use the PRODOS CONVERT program and reverse the direction of the

Listing 1

```
DISK VOLUME 254

*B 064 INSTALL PT#4
*B 005 HICHAR.OBJ0
*B 002 HIGEN1.OBJ0
*B 069 BACKUP/RESTORE
*A 011 MAIN MENU
 B 005 HELLO-PCPI.OBJ0
*A 006 HD DOS DIRECTORY
*B 003 PARK HEADS
*A 007 DIAGNOSTICS
 B 005 HELLO-2.23.OBJ0
*A 006 FLOPPY FORMAT
*B 021 FCP'S 'FID'
*B 005 HELLO PASCAL
*A 007 MAKE BOOT TRACK
*A 002 HELLO PRODOS
*A 002 HELLO DOS
*A 009 SUPPORT UTILITIES
 B 060 PRODOS
*A 016 CHANGE PASCAL UNIT
*A 015 CHANGE CPM UNIT
*A 002 USER MENU
*B 024 LBLDSK
*B 026 CHKDSK
*A 006 LBLDSK.SOURCE
*A 007 CHKDSK.SOURCE
```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Listing 2

```
] PR#0
]LIST 30-150

 30  PRINT "   WHICH FUNCTION WOU
     LD YOU LIKE ?"
 40  VTAB 9: HTAB 1
 45  IF DF = 1 THEN  INVERSE
 50  HTAB 9: PRINT " 1)  BOOT INT
     O PASCAL        ": NORMAL
 60  PRINT : IF DF = 2 THEN  INVERSE

 70  HTAB 9: PRINT " 2)  BOOT INT
     O CP/M          ": NORMAL
 80  PRINT : IF DF = 3 THEN  INVERSE

 90  HTAB 9: PRINT " 3)  BOOT INT
     O DOS           ": NORMAL
 95  PRINT : IF DF = 4 THEN  INVERSE

100  HTAB 9: PRINT " 4)  BOOT IN
     TO PRODOS       ": NORMAL
110  PRINT : IF DF = 5 THEN  INVERSE

120  HTAB 9: PRINT " 5)  RUN SUP
     PORT UTILITIES ": NORMAL
130  PRINT : IF DF = 6 THEN  INVERSE

140  HTAB 9: PRINT " 6)  BOOT IN
     TO SLOT #6      ": NORMAL
147  PRINT : IF DF = 7 THEN  INVERSE

150  HTAB 9: PRINT " 7)  QUIT AN
     D PARK HEADS    ": NORMAL
```

Listing 3

```
]LIST 290-340

 290 A$ =  CHR$ (A)
 300  IF A$ = "1" THEN 600
 310  IF A$ = "2" THEN 650
 320  IF A$ = "3" THEN 700
 325  IF A$ = "4" THEN 900
 330  IF A$ = "5" THEN 750
 335  IF A$ = "6" THEN 800
 337  IF A$ = "7" THEN 850
 340  IF A$ = "Q" THEN  HOME : END

]LIST 900-1000

 900  HOME : VTAB V: HTAB 12: PRINT
     "LOADING PRODOS": PRINT D$;"
     BLOAD PRODOS":SLOT =  PEEK (
     2040): POKE 67,SLOT * 16: POKE
     70,SLOT * 16: CALL 8192
1000  REM
```

transfer to get a DOS 3.3 copy of ProDOS. I then used a catalog program which shows the address and length of files to get the parameters for the ProDOS file. Using these parameters and the DOS 3.3 BSAVE command, I wrote a copy of ProDOS into the DOS 3.3 partition of the Sider disk. Booting into ProDOS now loads my version 1.1.1.

Raymon P. Ratte

ProDOS Time Bomb Disarmed

I feel compelled to respond to Bruce Field's remarks in the May, 1985 *Call -A.P.P.L.E.* regarding the limitations of the ProDOS date stamp feature. Having torn into ProDOS to make it work with my Mountain Computer AppleClock card, I am quite familiar with the algorithm it uses for deriving the year. Bruce is right about there being a time bomb, but he's wrong about

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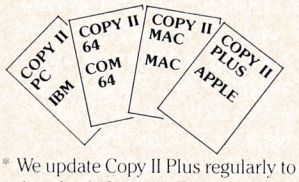

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the date and the reason for it.

ProDOS expires on December 31, 1987. On January 1, 1988, ProDOS' Thunderclock algorithm will stamp your files 1 JAN 82. The fact that this happens in a leap year is purely coincidental. Leap year adjustment is factored into the algorithm already; the expiration date results from the rather shortsighted way Apple designed the ProDOS year lookup table. Fortunately, it is quite easy to update, once you know how. Letting you know how is the purpose of this letter.

ProDOS performs a rather elaborate calculation to figure out what day of the week the Thunderclock date would be if this were 1984. It then effectively subtracts the value found in Thunderclock's day of week register, and adds 7 if the result is less than zero. The resulting offset serves as an index into a 7-byte lookup table that contains the corresponding years. This table contains the sequence (in hexadecimal) 54 54 53 52 57 56 55. These are the equivalent of decimal 84, 84, 83, 82, 87, 86 and 85 respectively, which are the years in which ProDOS functions properly. To breathe new life into ProDOS, you can change the first four bytes of this table to (hexadecimal) 5A 59 58 58, which equal decimal 90, 89, 88 and 88 respectively. This will extend its usefulness to the end of 1990. Notice that a leap year must be repeated in two successive bytes, and the table wraps around from the last byte back to the first (years in descending order). If you remember to change the values in this table every 5 or 6 years, ProDOS will keep up with you for as long as you own your Apple!

Making the patch is easy, once you find that table of years in the PRODOS System File image. Start by booting up a backup copy of ProDOS, then type, **BLOAD PRODOS,A$2000,TSYS.** Enter the monitor with CALL -151. Look for the sequence of hexadecimal bytes noted above, and patch them up as I have described. Then save the updated file with **BSAVE PRODOS, A$2000,L15360,TSYS** (be sure to use the same L parameter shown in the "Endfile" column of the 80-column ProDOS directory). I found the table of years at $5076 in both ProDOS 1.0.1 and ProDOS 1.0.2. If you have a more recent release, it may be in a different place; one version I examined had it exactly one page lower (at $4F76). After testing it to make sure everything works O.K., you can copy this updated PRODOS file to all to your bootable ProDOS disks. You might want to make a note on the label, "Valid through 1990." Then in 1990, you would change he series to 5A 5F 5E 5D 5C 5C 5B, renewing it through 1995, etc.

Bruce left one of his reader's questions unanswered: how to access the year from BASIC. This depends on whether you're using ProDOS or DOS 3.3.

In ProDOS, the automatic date stamp feature makes this a breeze. A statement of the form **YY=1900+INT(PEEK(49041)/2)** will return the current ProDOS year through 1999 (provided ProDOS is properly updated as described above). In 2000, change the 1900 to 2000 and you're all set for another century!

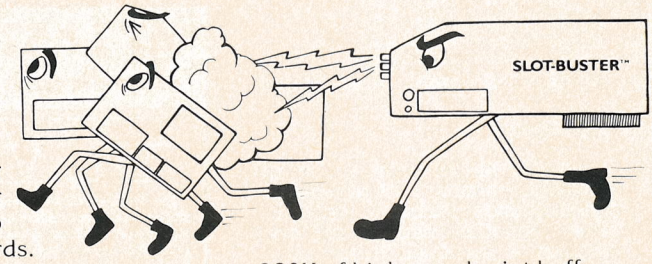
Since DOS 3.3 doesn't have a built-in date stamping algorithm, and Thunderclock doesn't track the year by itself, your DOS 3.3 programs will have to maintain a **DATEFILE** on the disk. Use this simple program to initiate **DATEFILE**

```
10  PRINT CHR$(4); "OPEN-
    DATEFILE"
20  PRINT CHR$(4);
    "WRITEDATEFILE"
30  PRINT 1985
40  PRINT 7 : REM Assumes this is
    July; change accordingly.
50  PRINT CHR$(4); "CLOSE"
60  END
```

Once this has been done, add the following subroutine to your program that reads the clock:

```
60000  REM Before calling this
       subroutine, read the clock in the
       usual manner and store the
       month (1 to 12) in variable MM.
60010  PRINT CHR$(4); "OPEN-
       DATEFILE"
60020  PRINT CHR$(4);
       "READDATEFILE"
```


No printer interface card ever sounded this good



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Circle 39 on Reader Service Card

```
60030   INPUT YY : INPUT MD
60040   PRINT CHR$(4); "CLOSE"
60050   IF MD = MM THEN RETURN
60060   IF MD MM THEN YY = YY + 1
60070   PRINT CHR$(4); "OPEN-
        DATEFILE"
60080   PRINT CHR$(4);
        "WRITEDATEFILE"
60090   PRINT YY : PRINT MM
60100   PRINT CHR$(4); "CLOSE"
```

This routine returns with YY equal to the current year. The advantage of this method is that it never, ever expires! The only way you can mess it up is by failing to use the program at least once every 11 months. Letting a longer period elapse between uses will result in failure of this algorithm to update the year. That situation is readily fixed by using an updated version of the **DATEFILE** initiation routine.

The situation with ProDOS offers a sad commentary on Apple Computer's opinion of the longevity of the Apple II series. Even the 1985 versions contain year tables that go back to 1982 and expire in 1987. You think that each new release would contain a current table of years. Apparently they don't expect any ProDOS users to be around 30 months from now! Boy, are *they* in for a surprise! I wouldn't want to be Apple's telephone operator on the first business day of 1988.

Clay Ruth

Reducing or Encouraging Piracy

Sometimes I wonder about what is going on inside the heads of some company policy setters. Living Videotext has announced a new policy regarding protection of their ThinkTank 512 for the Macintosh. After buying the product, you can now buy a non-protected copy of the same thing for an additional $40.00. The copy protection is intended to reduce piracy, and this new policy is supposed to restore convenience to hard disk users. So what happens when a frustrated user receives this offer?

"Hey, friend. The publisher of ThinkTank just offered me a non-protected copy for forty bucks. In other words, now they want me to pay extra for the convenience that they intentionally held back when I first bought it. Tell you what—*you* pay the $40.00, and when I get the non-protected disk I'll make you a copy and loan you the manual."

Is this new policy going to reduce piracy or encourage it?

Dan Paymar

We are beginning to see this option of non-protected versions at extra cost appearing more often. We'd be interested in printing the opinions of other users and software companies in these pages—The Editors.

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Use HIDOS command in hello program for turnkey startup, adding 10K free memory to run 30% larger Applesoft programs than ProDOS. Moves DAVID-DOS II and 4 buffers above main memory.

Ultra-Fast Garbage

New FRE command collects a memory full of 6000 strings that are half garbage in two seconds. DOS 3.3 takes 12 minutes. FRE is so fast it is not noticeable during run of most programs.

Clock Dating

Automatic date stamping of disk files is set up for 6 kinds of clocks or Hello manual date entry. New DATE command will auto-insert date in correspondence.

All times in seconds. (Time Test programs available)		DAVID DOS-II	ProDOS	DOS 3.3
TEXTFILES (100 Sectors)	TSAVE	8.0	NO	NO
	TLOAD	6.2	NO	NO
(791 Strings,	WRITE	29.3	28.0	88.4
32 chars ea)	READ	24.3	16.3	83.8
	PRINT/READ	44.2	45.9	117.1
(442 Sectors, 7 x 500)	APPEND	142.3	142.9	1231.2
APPLESOFT (100 Sectors)	*SAVE	6.4	16.4	33.1
	LOAD	5.0	4.0	23.5
INTEGER (100 Sectors)	*SAVE	6.6	NO	33.4
	LOAD	4.9	NO	23.4
BINARY (100 Sectors)	*BSAVE	7.3	18.4	28.7
	BLOAD	5.8	4.8	24.5
48K PROGRAM SPACE	APPLESOFT	36,352	NO	36,352
(With 3 Bufs avail)	INTEGER	36,352	NO	36,352
	BINARY	36,352	34,816	36,352
64K PROGRAM SPACE	APPLESOFT	46,592	32,256	35,756
(With 4 Bufs avail)	INTEGER	46,592	NO	35,756
	BINARY	46,592	41,728	35,756

*Add 5 seconds for Verify. Apple II, Applesoft & ProDOS are trademarks of Apple

Ten New DOS Commands

1. HIDOS moves DOS above 48K memory.
2. FRE makes ultra-fast garbage collection.
3. DATE stamp files. Clock or manual dating.
4. TLOAD speed loads all Text Files to mem.
5. TSAVE speed saves Text Files from memory.
6. TLIST lists all Text Files to screen/printer.
7. DUMP Binary/Ascii to screen or printer.
8. DISA disassembles Binary to screen/printer.
9. AL prints program Address & Length.
10. / is a one keystroke Catalog.

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Circle 19 on Reader Service Card

Identical Operation

All new commands operate identical to old DOS commands on the keyboard & in programs.

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Install DAVID-DOS II on your full disks in three seconds without touching the programs. Create bootable high-speed new disks with a Basic, Binary, or Exec Hello & 35/40 tracks. Create Data-Disks with 30 extra sectors.

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All DOS entry addresses have been preserved. DOS is same length and compatible with most software. David-Dos is fully copyable. Init areas were used for David-Dos. Works with all Apple IIs including IIe, IIc, Franklin & Basis with 48K/64K/128K & Corvus & Xebec Hard Disks. Complete documentation and many utilities are on the disk.

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THE MARKETPLACE

The following items are selected by our editorial staff from the large number of product announcements and news releases sent to us daily. They are presented solely to keep you informed about the current market for Apple related hardware and software. As we have not tested many of these products, appearance here does not necessarily represent endorsement or recommendation by A.P.P.L.E. Further information about items appearing in The Marketplace can be obtained through the Reader Service Card. If you contact any manufacturers directly, please mention that you learned about them in *Call-A.P.P.L.E.*

LITTLE COMPUTER PEOPLE

Activision Inc. announces the release of a commercial version of the successful laboratory computer software used in their Little Computer People Research Project (LCPRP). The research software will allow owners of Apple II's to make contact and establish relationships with the Little Computer People living inside their computers.

The essential component of the commercial product is a 2½ story "house-on-a-disk" which lures out the LCPs and on which they take up residence. A guide to help the computer owner care for and communicate with Little Computer People is also included.

In addition to the software and the Care and Communications Guide, computer owners will be provided with a Deed of Ownership which will allow them to register their Little Computer Person's house with Activision and become official members of the Research Project. A Special Edition of *Modern Computer People* magazine, which details the history and culture of the LCP, is also a part of the Discovery Kit. Price: $39.95. *Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043, (415) 960-0410.*

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Circle 20 on Reader Service Card

HOUSEKEEPING WITH A MOUSE

International Solutions introduces Mouse Desk, a desktop organizer which simplifies "housekeeping" activities such as copying, moving or deleting files. With Mouse Desk, the user executes all tasks with a point-and-click technique, using a mouse to move icons that represent disks and files.

Mouse Desk also functions as a program selector. Instead of swapping disks, the user can switch rapidly between programs loaded on a mass storage device. This program works with all hard disks for the Apple II line, as well as with Apple's UniDisk 3.5 and Apple II Memory Expansion Card.

By moving the icons and selecting commands from pull-down menus the user can format and erase disks, as well as move, copy, delete, lock/unlock, rename and sort files. The program provides useful information, such as the size of each file, whether it is locked or unlocked, a list of storage devices connected to the system, and available memory for each device.

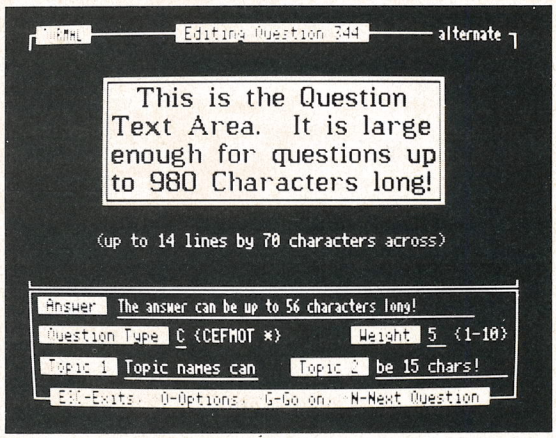
When used with Apple's Memory Expansion Card, Mouse Desk automatically reloads itself and any previously designated combination of programs as soon as the Apple II is turned on, and switching between them is fast and easy.

Mouse Desk also provides a simple hierarchical filing system that uses a file folder icon instead of sub-directories and pathnames. The program will sort individual files as well as folders by name, date, size, or type. It runs on either the Apple *IIc* or Apple *IIe* computer equipped with an Extended 80-Column Card and one floppy disk drive. An Apple II compatible mouse is recommended, but Mouse Desk can also be operated from the keyboard.

Two versions are available, a copy-protected version for $39.95 and a non-copy-protected version for $69.95. *International Solutions, Inc., 910 West Maude Avenue, Sunnyvale, CA 94086, (408) 773-0443.*

Circle 50 on Reader Service Card

AN EDUCATORS TOOL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alternate
This is the Question Text Area. It is large enough for questions up to 980 Characters long!
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Seven Hills Software announces QuickTests, test generating software for educators who use Apple *IIe*, and *IIc* computers. This program assists educators by selecting test questions from a databank of questions on disk, and printing tests.

QuickTests has a large question text area in which any type of question may be entered. Standard and alternate characters (e.g. foreign language, math, etc.) can be shown on screen and printed. It comes with an easy to read user's guide, free automatic updates for one year, and telephone help-line.

Price: $155 (protected), $180 (unprotected). *Seven Hills Software, 2310 Oxford Road, Tallahassee, FL 32304, (904) 576-9415.*

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Price: $490.00. U.S. distributor: *Greengate Productions Inc., 2041 Pioneer Court, #15, San Mateo, CA 94403, (415) 345-3064.*

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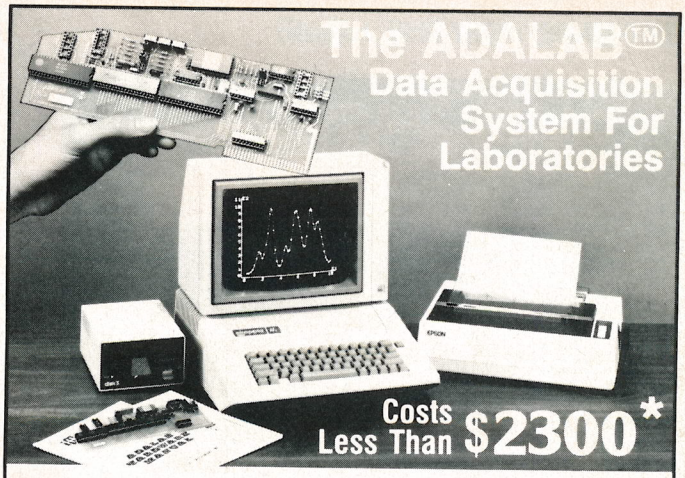

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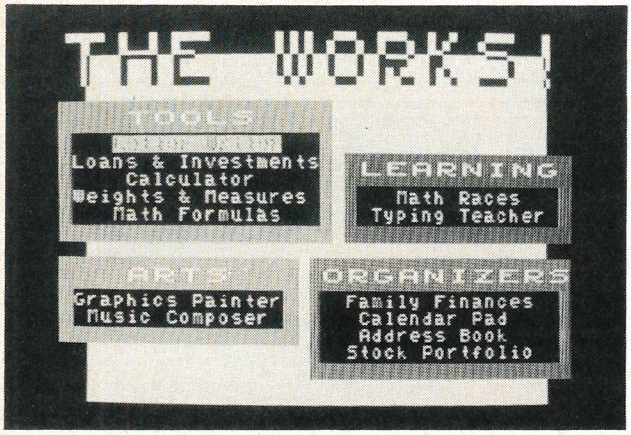
SOFTWARE FOR THE HOME



First Star Software, Inc. announces THE WORKS! A Complete Collection of Home Software for the Apple II. This top-value home productivity package features 13 integrated modules—all on the same side of one disk.

THE WORKS! includes a Graphics Painter, Typing Teacher, Letter Writer, Calculator, Music Composer, Family Finance Program, Stock Portfolio—plus 5 more. Designed to show how useful a computer at home can be. Price: $49.95. *First Star Software, Inc., 18 East 41st Street, New York, NY 10017, (212) 532-4666.*

Circle 53 on Reader Service Card

SOFTWARE FOR VCR OWNERS

VideoFile is a program that keeps track of up to 150 programs recorded on up to 50 numbered videotapes. It allows the user to define three categories for programs, listing the shows all-inclusively or by category, in order of length, or alphabetically. It can be used by owners of both Beta and VHS.

This program also keeps users from accidentally erasing programs, and automatically converts VCR counter numbers into an easily understood hours/minutes format. A demonstration disk is available for $10.00 with the understanding that it can be returned for $10.00 credit towards the purchase of VideoFile. Estimated price: $59.95. Further information is available by contacting Robert Claster at VideoFile. *VideoFile, Box 480210, Los Angeles, CA 90048, (213) 655-6795.*

Circle 54 on Reader Service Card

ADD ANIMATION

ProImage is a menu driven, interactive system for adding full screen, smooth flowing animation to BASIC or machine language programs. Create your own pictures, or capture full color images from any other video or graphics system.

- PIXED, or Pixel Editor, enables you to design, preshift, edit and save color images as bit-mapped blocks. PIXED also lets you add text to your images. Choose from four different drawing modes, create images of any size, add text to graphics, shape-shift objects across the screen.
- TABLE, allows you to build a table of images so that any image can be instantly drawn by number anywhere on the hi-res screen.
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For Your APPLE**

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Expand your IIe with 80 COLUMNS and 64K MEMORY including double high resolution graphics on "B" motherboard**

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COPYCARD

The COPYCARD is capable of making archive copies of your copy-protected software, a must for game players. The COPYCARD converts a copy protected program into a non-copy protected program in a standard COPY A format, giving you the opportunity to correct the software to use non-supported hardware, Typical hardware changes are for 80 column cards, printer interfaces, and other I/O devices. NOTE, SYSTEM REQUIREMENTS: Apple* II, II + require 16K RAM card and one disk drive with 3.3 DOS. WILL NOT WORK at this time with Apple* IIe computer. COPYCARD comes with utility software. KIT: $50.00 READY TO USE: $80.00

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A PROGRAMMMER'S AIDE

The Basic Calculator is a unique programmer's aide and computational tool. It can be accessed from Applesoft immediate mode, the monitor, and is callable from a running Applesoft BASIC program. It's a "transparent," co-resident program. Load, edit and run other Applesoft BASIC programs with the calculator installed. It resides in the language card area, leaving 35K + for your BASIC programs and operates under DOS 3.3. It is compatible with the Global Program Line Editor. (48K version).

Display Features

- Looks just like a hand-held calculator on the screen.
- Accessed with a key storke.
- Restores the screen when you exit the calculator.
- Works in 40 or 80 column mode with Apple II computers.

Operational Features

- Numbers and arithmetic operators entered like a standard hand-held calculator. (Up to nine digit number entry.)
  - Up to nine significant digits for results of calculations and uses floating point exponential notation for larger results.
  - Operates in decimal, hexadecimal, and binary modes.
  - Decimal calculations in the range of -E+/-37 to +E+/-37.
  - Hex calculations in the range -16777216 to =16777215 (Dec.).
  - Binary calculations in the range -511 to +511 (Dec.).
  - 2's and 16's complement notation for negative binary and hex.
  - Includes function which returns ASCII character codes.
  - Two single digit memory registers. Plus "add to" and "subtract from" memory functions.
- Eighteen additional functions. Including:
  - PEEK and double PEEK functions.
  - Determine double POKEs for integers between 0 and 65535.
  - Convert between pos and neg equivalent memory addresses.
  - Byte length of last Applesoft or binary file BLOADed.
  - OR, XOR, AND operations on single byte numbers.
  - Convert degrees to radians.
  - Determine base memory addresses for text page, hi-res page.
  - 1/X, natural log, sine, cosine, tangent, inverse tangent.

Price: $14.50 plus $2.00 shipping and handling. *Genial Software, Inc., P.O. Box 20281, Indianapolis, IN 46220 (317) 251-4721.*

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STORE DIFFERENT FILES TOGETHER

Nordic Software announces Profix 2.1 which allows use of DOS 3.3 on any mass storage device having a ProDOS device interface. This includes both the 5 & 10 meg ProFiles, the UniDisk 3.5 and other drives.

Profix 2.1 features:

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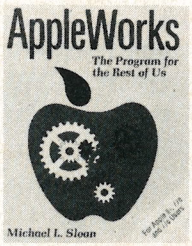
- "Link" several drives together and use them as one drive.
- Backup/Restore utilities for all volume sizes.
- Supports up to 14 drives at once.

Profix 2.1 runs on Apple II computers with 64K. Price $69.95 plus $3.00 shipping and handling. *Nordic Software, Inc., 4910 Dudley Street, Lincoln, NE 68504. Toll free: (800) 228-0417.* Circle 57 on Reader Service Card

Polish your Apple skills with Scott, Foresman computer books

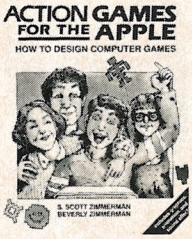
AppleWorks: The Program for the Rest of Us

by Michael L. Sloan.



This tutorial gives up-to-date, inside information on AppleWorks from an Apple expert. It guides you through all 3 applications and explains how to use AppleWorks with over 25 non-Apple printers. **$18.95,** 320 pages

Action Games for the Apple: How to Design Computer Games

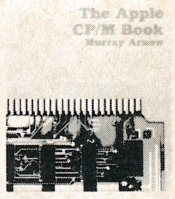


by S. Scott & Beverly B. Zimmerman.

Shows Apple II, IIe, II+, and IIc owners how to create their own computer games. Provides 11 exciting game examples and many programming techniques. **$12.95,** 256 pages

The Apple CP/M Book

by Murray Arnow.



One of the first CP/M books specifically for Apple users. Explains how CP/M works, how to use its commands and utilities, and more. **$12.95,** 164 pages

To order, contact your local bookstore or computer store, or send the order form to

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Enter the Eamon universe in style. The Starter Set comes with Super Eamon, The Haunted House, and four high-quality adventures from the Public Domain, plus a short guide to the Eamon universe. Each of the adventures has the new Map command, which shows you a map of where you have been -- your Apple does the mapping for you! Requires a 64K Apple II. available Nov 15..... $ 37

[Purchased separately, this package could cost you $50 or more!]

Super Eamon

Replaces your old, text-only Eamon Master with graphics, animation, and fun. Super Eamon's Main Hall has more shops to visit, and a faster DOS speeds you on to your adventures. Access any of the 92 Public Domain adventures. You'll need a 64K Apple II. available now.....$ 20

The Haunted House

GREAMON #1: our first GRaphics EAMON adventure. Explore the House with full color graphics. Kill the monsters, and find the treasure... or is it that simple? Requires a 64K Apple II and Super Eamon or an Eamon Master disk. available now.....$ 15

little green software

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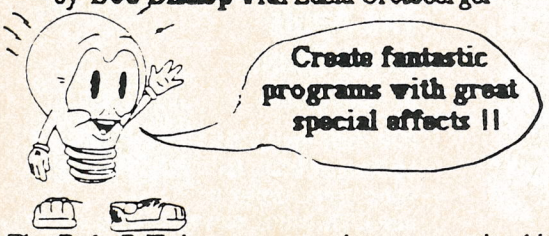
THE P.A.C.K.

(Programmer's Assembly-language Construction Kit)

by Bob Bishop with Lucia Grossberger



The P.A.C.K. is a programming construction kit that gives you a multitude of building blocks (subroutine modules) and the utilities (the Editor, Assembler, and Linking Loader) to put these blocks together to build or add to your own programs. The P.A.C.K. also provides tools for creating your own subroutine library.

An exciting tool thats easy to use !

The documentation provides complete instructions for using the Editor, creating relocatable files, running the Linking Loader, and using the subroutine libraries.

PRICE: $49.95 (plus $3.00 shipping- all sales tax as applicable)

Specify DOS 3.3 or ProDOS when ordering.

PUBLISHED BY: INTERACTIVE ARTS

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TAX PACKAGE

AHWARE announces TAXPAK-86, an interactive tax preparation program designed and priced for home use. The program will guide the user through the preparation of the 1985 IRS Form 1040 and schedules A, B, C, D, G, SE and W. All sub-totaling and tax computation are completed automatically. The user may print out the return and then use the supplied transparencies to photocopy the return for submittal to the IRS.

As each entry is made, all affected lines are updated and information is transferred from form to form. The bottom line of the display screen will always give your current tax liability as well as the impact of the most recently entered transaction. This "instant bottom line" lets users perform "what-if" simulations and explore alternative tax strategies.

TAXPAK-86 comes with a user's manual, two-sided disk, and printout transparencies. It incorporates full screen editing, and allows the user to prepare multiple returns. TAXPAK-86 runs on any Apple II computer wih a minimum of 64K and one disk drive.

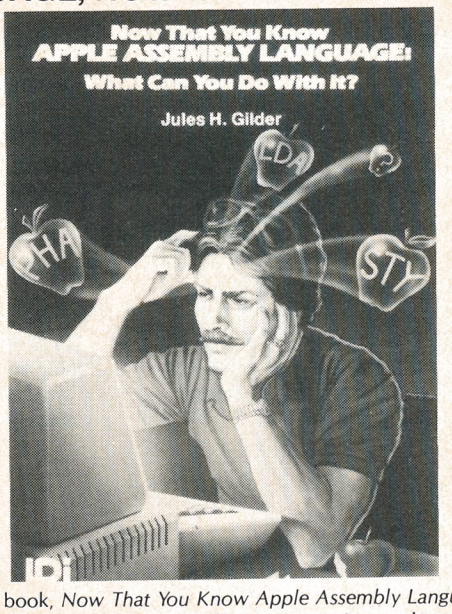
Price: $39.95. *AHWARE, 805 Luz Court, Danville, CA 94526, (415) 837-7346.* Circle 58 on Reader Service Card

DISK MANAGEMENT SYSTEM

DATATANK, Inc., announces the release of a product designed to store and retrieve large numbers of diskettes. The system is made up of modular boxes that interlock side by side or on top of each other. A spring-loaded mechanism raises up to 10 diskettes into easy reach, and any number of modules can be combined. The self-adhesive labeling system, using color, letter and number combinations, can accommodate the indexing of millions of diskettes. DATATANK 5.25" Datafinder Diskfile and Security Label/System Three pack sells for $23.95. The Datafinder System with specially labeled DATATANK Box is priced $14.95.

Datafinder's software is user-friendly and guides you to any disk in moments. It includes features such as printing, sorting, logging, single-keystroke date notation and security password. The DATATANK *Index Software containing the disk, manual and specially labeled DATATANK Box sells for $79.95. For more information contact: DATATANK, INC., One Appletree Square, Minneapolis, MN, 55420, (207) 967-3544.* Circle 59 on Reader Service Card

YOU'VE LEARNED ASSEMBLY LANGUAGE, NOW WHAT?



A new book, *Now That You Know Apple Assembly Language: What Can You Do With It?* from Redlig Systems, Inc., takes the reader step-by-step through the assembly language programming experience, showing the reader how to develop his or her own library of useful subroutines.

The book also delves into the mysteries of the 6502 stack and shows how it can be used to increase the power and versatility of assembly language programs. It also teaches the reader to use Apple's built-in routines to minimize the amount of additional coding that must be done. Price: $19.95 plus $2 shipping and handling. *Redlig Systems, Inc., 2068 79th St., Brooklyn, NY 11214, (718) 232-8429.* Circle 60 on Reader Service Card

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SOFTWARE FOR WINNERS

Avant-Garde introduces a new computerized training tool, JOE THEISMANN'S PRO FOOTBALL. Joe combines the technology of personal computers with more than 20 years of football experience. He gives advice on training and strategy, teaching you expert quarterbacking techniques, improving your overall football skills, and helping you to understand the finer details of the game. Plays are choreographed with live-action diagrams. Formations, running and passing techniques, quarterback position, stance, cadence, and strategy are highlighted with colorful close-up animation. There are also details of handoffs, the passing tree, and how to beat defenses.

This program walks you through an illustrated library of equipment, describes player positions and terminology and has advice on training and conditioning for flexibility. When you are ready, you can put it together in an action-packed game featuring you as the quarterback. The 64K Apple II version retails for $39.95.

THE ENTERPRENEUR'S GAME teaches the rules, fundamentals and tactics of entrepreneurial success. It begins by helping you write a step-by-step business plan. Then it challenges you to raise $20,000 in seed capital and navigate your business plan without making a mistake.

This game shows you what some of America's greatest entrepreneurs might do in similar situations and provides advice and capital from successful entrepreneurs. By analyzing your pofile, calculating business curves and forecasting the economic climate, THE ENTREPRENEUR'S GAME gives you a chance to test your skills in a simulated environment. Available for the Apple II series with 64K RAM. Price $49.95. *Avant-Garde Publishing Corporation, 37B Commercial Blvd., Novato, CA 94947, (415) 883-8083.*

Circle 61 on Reader Service Card

BREAK THE LANGUAGE BARRIER

The Covox VOICE MASTER, a hardware/software system, provides speech and music synthesis as well as voice recognition capabilities. The user digitally records his or her own voice in any language to provide the vocabularies of up to 64 words or phrases each for the unit. The recorded vocabularies are then played back to reproduce the words or phrases as directed by the user, closely resembling a tape recording of the user's voice.

The VOICE MASTER is capable of accurate voice recognition and can recognize and store vocabularies of up to 32 words or phrases each on disk. Vocabularies for both speech and recognition may be instantly called and loaded from disk. It also can provide music creation, editing and printing capabilities. The "voice harp" program allows the user to hum or whistle a melody into the microphone (also included), store, play back, arrange, edit and print out the melody in true musical notation on graphics-capable dot matrix printers.

For Apple II series computers. Price: $89.95 including VOICE MASTER module, program disk, headset/microphone, connecting cables and documentation. *Covox, Inc., 675-D Conger Street, Eugene, OR 97402, (503) 342-1271.*

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TURBO ASSEMBLER

Turbosoft announces a fast and easy to use assembler for Apple II computers. It assembles 1500 line programs in only one second which is 5 to 100 times faster than any other Apple assembler.

The TURBO Assembler has a full-screen coresident editor without line numbers. As with a word processor, you simply move the cursor over the program and make the desired changes, *without* having to EDIT, LIST, RENumber, or press RETURN.

In addition, the editor features *interactive syntax correction* which does away with those frustrating syntax errors. If there is a syntax error (you've typed in LDS instead of LDA, for example), the cursor is placed on the first offending character, ready for editing.

The TURBO assembler features a high speed macros, conditional assembly, interactive syntax checking, interactive assembly, source code compression, local labels (alphabetic ".LOOP" or numeric ".2"), source file chaining, automatic line formatting, up/down scrolling, horizontal scrolling in 40 columns, Apple *IIe* 80-column card support, forward/backward page movement, label search (allows you to instantly jump to part of your program by typing a label name), visual (on-screen) markers for fast and easy block copy/move/delete/save and list, search and replace with wildcard feature, automatic line insertion, source file hiding and appending, assembly to a text file. Price: $49.95 (U.S.) plus $2 shipping. Unprotected with 130 page manual.

TURBOSOFT Computer Software, 28 Stratford Road, Montreal, Quebec, Canada, H3X 3C5.

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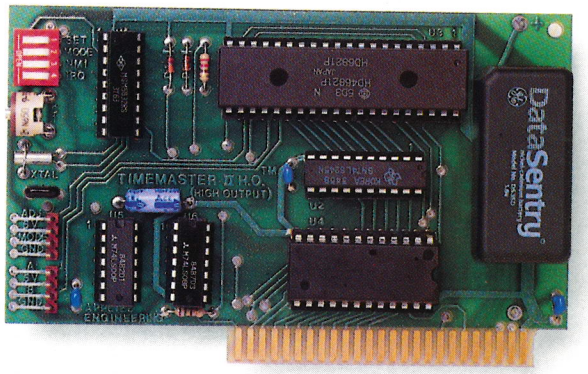
Timemaster H.O.™, the only clock that displays time and date on AppleWorks'™ screens and files.



Now, get all the features of all the competition combined!

It's the smart way to put the time and date on your Apple II+® or IIe®. Because only the Timemaster H.O. packs *ALL* the features of all the competition *combined,* including leap year, year (not just in PRO-DOS), month, date, day of week, hours, minutes, seconds and milliseconds. It's totally PRO-DOS, DOS 3.3, PASCAL and CP/M compatible. And of course, it works better than any other clock with AppleWorks.

If you're using or writing software for other clock cards, you're still covered. Because the H.O. will *automatically* emulate them. And the Timemaster H.O. adds 14 new commands to BASIC. The H.O. even comes complete with two disks full of sample programs, including a computerized appointment book, a DOS dating program, interrupt programs, and over 30 programs that others charge extra for — or don't even offer.

As a low-cost option, you can add true BSR remote control to the H.O., giving you remote control of up to 16 lights and appliances in your home or office.

• Fully PRO-DOS and DOS 3.3, CP/M and PASCAL compatible • Time in hours, minutes, seconds and milliseconds (the ONLY PRO-DOS compatible card with millisecond capability); date with year, month, day of week and leap year • 24-Hour military format or 12-hour AM/PM format • Eight software controlled interrupts so you can run two programs at the same time (many examples included) • Allows AppleWorks to time and date stamp all data automatically • The only clock card that displays time and date on the AppleWorks screen • Five year warranty

Clock price $129.00
BSR option (may be added later) ..... $ 49.00

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It really works!!

PLUS-WORKS not only allows you to have all features of AppleWorks™ on an Apple II™, II+ or compatible, but our extended memory versions give you capabilities far beyond the standard IIe/c versions. Its great for expansion on the **Apple IIe** as well.

Compare these features with other AppleWorks patch programs

- Copyable - make backups, transfer to hard disk
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- All control codes available to printer
- Supports Franklin computers and all ASCII keyboards
- Supports all major 80 column cards
- Permanent and dynamic ram disk features
- All versions of AppleWorks supported
- Expand AppleWorks desktop into CP/M ram cards
- Optional patch to help with printer problems

SPECIAL OFFER Thru March 1, 1986, send us our competitor's II+ modifier for AppleWorks (original disk or proof of purchase required) for a **$20.00** credit towards the purchase of our **XM** or **XMP** programs.

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- **PLUS-WORKS-XM & XMP** - $49.95 plus $3.00 Ship/hand. XM requires same as above with legend, saturn, or compatible ram card (A.P.P.L.E. Big board, know Drive, prometheus, etc) or Apple IIe with ramcard. XMP requires CP/M card with 64K ram (ALS, PCPI or Micropro).

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RGB COLOR BOARDS for the APPLE //e

THE KALEIDOSCOPE //™ **THE COLORMASTER™**

FEATURES:
The RGB Color boards provide the Apple //e computers with RGB (red/green/blue) video signals that produce crisp, vivid displays of color graphics and text with exceptional resolution and color quality. The full 16 Apple colors are authentically displayed in exact detail.

1. The boards plug into slot 7. Turn the computer on and they are ready to go.
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4. The Apple IIe extended or regular 80 column board signals automatically pass through the RGB board and DO NOT require switching or software commands for hi-res or double hi-res programs.
5. The boards are small sized, with GOLD EDGE CONNECTOR CONTACTS. Full warranty.
6. UNIVERSAL RGB MONITOR COMPATIBILITY.
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8. Our technical support staff can answer your questions regarding the RGB monitor.
9. Available thru Apple dealers worldwide.

SPECIAL FEATURES:
THE COLOR MASTER: A TEXT PAGE, in either 40 or 80, (and up to 160 columns) can be displayed in any 1 of 8 COLORS, software selectable, in direct or program mode, with simple "pokes". **THE KALEIDOSCOPE:** EACH LINE OF TEXT, BOTH FOREGROUND AND BACKGROUND, can be individually set to 1 of 8 COLORS, software selectable, in direct or program mode with simple "pokes"

Boards also available for Apple //+, //c, and Franklin ACE computers

PRICES:

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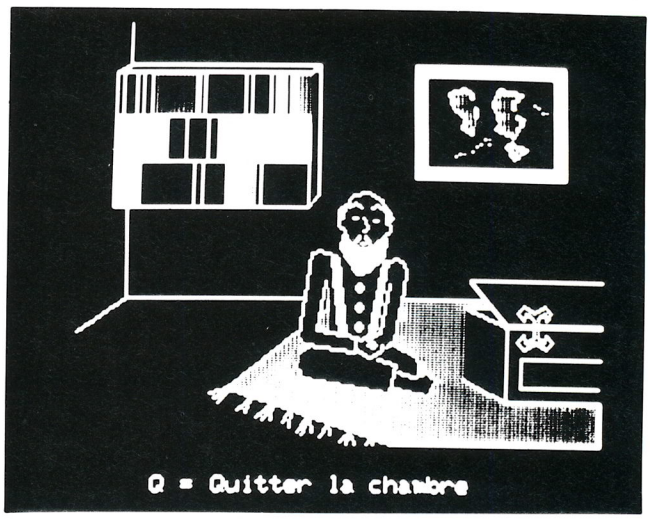

Gessler Educational Software has adapted several foreign versions of Spinnaker's Apple II programs to be used here in the teaching of foreign languages.

SNOOPER TROOPS is a mystery game which develops vocabulary and reasoning skills in the French language. Language skills are reinforced while students search for clues and question suspects to determine who committed the crime. Price: $49.95.

KIDS ON KEYS teaches Spanish vocabulary through pictures on the screen to beginning level pupils. Words are presented visually with four levels of difficulty and then drill reviews follow completion of each level. Price: $37.95.

With KIDWRITER, you can create a picture and then write a story to go with it, selecting from 100 characters and objects. It is available in French, Spanish, German and Italian and develops simple composition and vocabulary skills. Price $37.95.

When playing the game IN SEARCH OF THE MOST AMAZING THINGS, the players must find the planet Deirdron by overcoming obstacles as they travel in a spaceship and communicate in French. They visit areas and meet merchants to bargain and negotiate before continuing on their way. Price: $39.95.

GES has also made a foreign language version of WORD ATTACK available in French, Spanish, or German. Each program contains hundreds of vocabulary words in six categories: food, sports, travel, schools, professions, and everyday living. Within each category are three word lists: adjectives, nouns, verbs. There are four activites: a word display, multiple-choice quiz, sentence completion, and an arcade game. Recommended for advanced beginning to intermediate level students.

Price $49.95. *Gessler Educational Software, 900 Broadway, New York, NY 10003, (212) 673-3113.*

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THE WRITING ADVENTURE

Students learn to develop their writing skills with the new program from DLM, The Writing Adventure. This program, for the Apple II series computers, allows students to generate story ideas, take notes, write, edit, and then print their own stories.

Features

- Colorful graphics.
- Adventures to use as story lines.
- Prompting questions as aids in developing story lines.
- Word-processing capabilities for writing notes and stories.
- The option to print notes and stories.

The program consists of a Story Starter disk that presents the adventure scenes, brief scene descriptions, notecards, and prompting questions; a Story Writer disk that contains the word-processing capabilities for drafting, editing, and printing stories, a user's guide, and a quick reference guide that explains the steps to complete program activities.

Price: $59.95. *DLM, Inc., One DLM Park, Allen, TX 75002, (214) 284-6300.*

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SIMULATED SCIENCE LAB

SCIENCE TOOLKIT lets you turn your computer into a science lab, complete with a set of sophisticated instruments that perform the function of laboratory equipment. The MASTER MODULE includes three devices to get users started: a temperature-sensing probe, a light-sensing probe, and a special interface box that connects these probes safely and easily to the computer via the joystick port on Apple II's.

The program includes four on-screen lab instruments: a thermometer, a light meter, a timer and a strip chart. The User's Manual & Experiment Guide gives instructions for performing a wide variety of experiments as well as guidelines for further experimentation and exploration.

Broderbund will be releasing additional modules—including different external devices and new, software-based, on-screen instruments. SCIENCE TOOLKIT requires an Apple *IIe* or *IIc* (or II+ with joystick port adapter) with at least 64K of memory and one disk drive. Price $59.95. *Broderbund Software, 17 Paul Drive, San Rafael, CA 94903-2101 (415) 479-1170.*

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A PRODOS CASH REGISTER

High Technology Software Products, Inc. announces that The Store Manager is now available under the ProDOS operating system. This version is compatible with the Profile hard disk and virtually turns your Apple into a cash register. It produces invoices, purchase orders, receiving reports, expense vouchers, packing slips and quotations, and maintains up-to-the-minute sales totals. Valuable reports are generated which provide needed management information, including which items need to be reordered; which inventory items are the fast movers; and which products generate the greatest profits.

Price $295.00. *High Technology Software Products, Inc., PO Box 60406, Oklahoma City, OK 73146, (405) 524-4359.*

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DIGITAL SCOPE/SPECTRUM ANALYZER

Rapid Systems announces the digital scope/spectrum analyzer peripheral for Apple II computers. The digital scope features 4 channels, sampling rates from 100HZ to 2MHZ in 14 steps, adjustable gains from 100mv/div to 20v/div in 8 steps, up to 500KHZ analog bandwidth, 2K by 8 data buffer, diode protected inputs, and separate trigger input with adjustable controls. Software features fast informative menu driven operation, extensive help file, color enhanced graphics, keyboard control of trigger/gain/timebase, assembly routines to speed data collection and display, zoom mode to view entire data buffer, active scrolling, grid display, extenive store/retrieve functions, post trigger delay, multi-channel display, print screen, and user definable interface routines to allow user to customize the application (use the unit as a data logger, vibration analyzer etc.)

The spectrum analyzer features FFT sizes from 16 to 1024, execution times from 2 sec (16 point) to under 10 sec (1024 point), sample frequency choices fom 100HZ to 500HZ, input voltage ranges fom 1.6v p-p to 320v p-p, rectangular or Hanning windows, baseband or venier operation, power spectrum computation, power spectrum averaging, better than 1HZ resolution, save/recover spectrums to disk, hardware/software/keyboard triggering, and transfer digital scope time series data to the spectrum analyzer for frequency analysis.

Price: $798. *RAPID SYSTEMS, 659 North 34th Street, Seattle, WA 98103, (206) 547-8311.*

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RECOVER CRASHED DISKS

The new Locksmith version 6.0 is now available and includes an advanced disk recovery utility, a framing-bit analyzer, an automatic boot tracer, a sector editor, many file utilities, and of course, a powerful bit-copy program. A fast disk backup utility copies disks in 8 seconds. Includes a library disk which contains automatic procedures to copy hundreds of Apple programs.

System requirements: 48K or 64K Apple II, II+, *IIe*, or *IIc* with one or two disk drives. Price $79.95. Registered Locksmith 5.0 owners may upgrade to version 6.0 for $29.95.

Alpha Logic Business Systems, 4119 North Union Road, Woodstock, IL 60098, (815) 568-5166.

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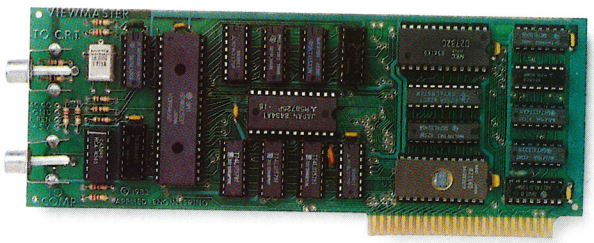

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SUPRTERM		√					√	√	
WIZARD 80					√		√	√	
VISION 80	√	√			√				
OMNIVISION		√					√	√	
VIEWMAX 80	√	√			√			√	
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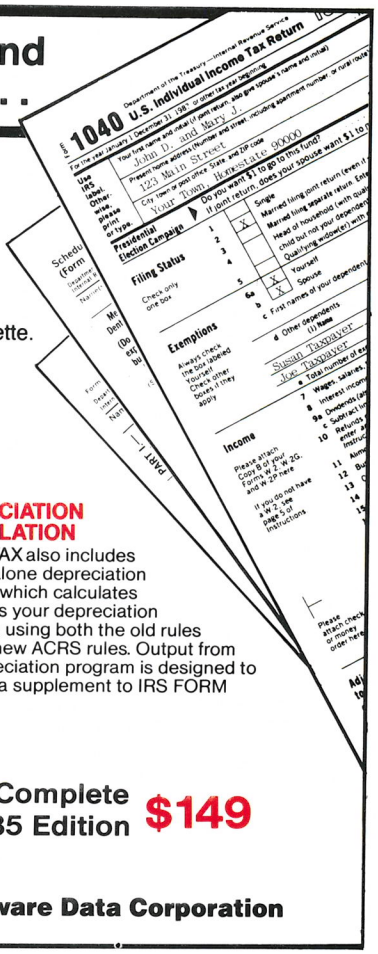

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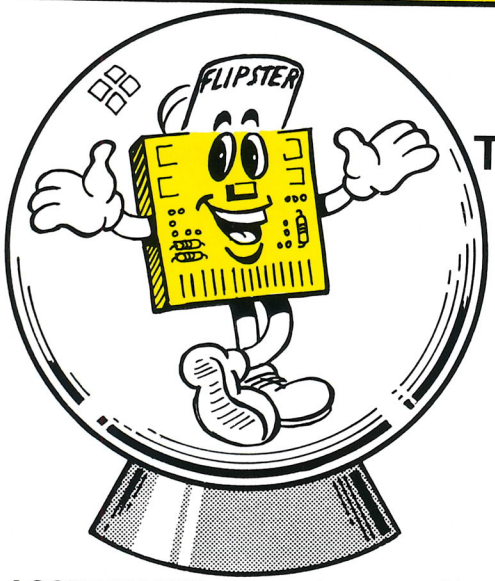

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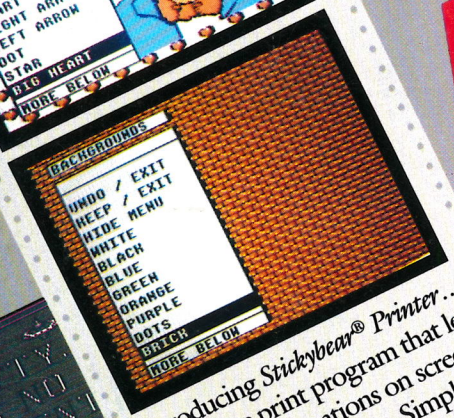
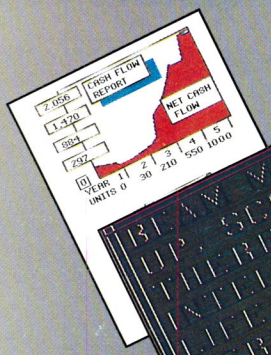
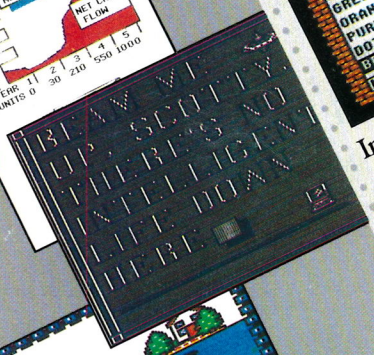
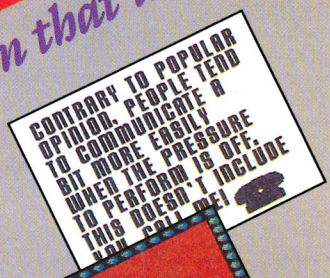
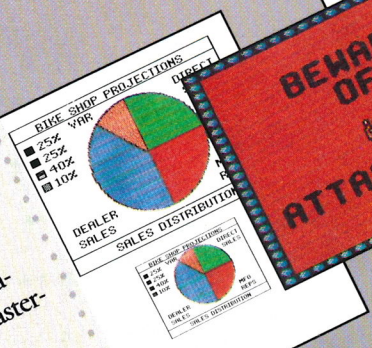
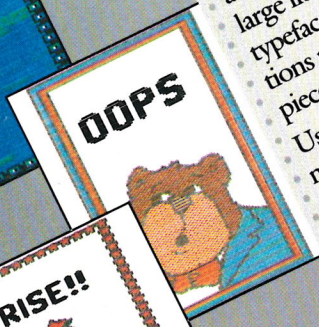


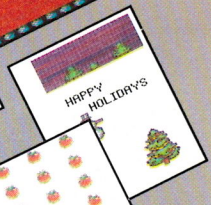


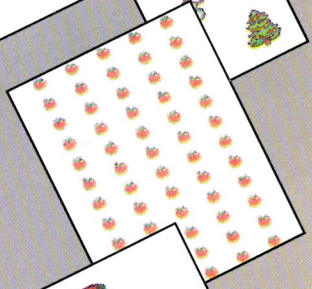



CONTRARY TO POPULAR OPINION, PEOPLE TEND TO COMMUNICATE A BIT MORE EASILY WHEN THE PRESSURE TO PERFORM IS OFF. THIS DOESN'T INCLUDE

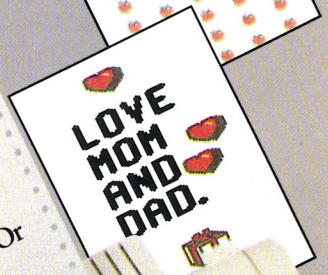








It was a beautiful summer day. Stickybear decided to visit his uncle's farm.
SURPRISE!!
HAVE A HAPPY DAY!
Stickybear saw three horses.



Introducing *Stickybear® Printer*... a software print program that lets you see your creations on screen as you compose them. Simple enough for children yet powerful enough to satisfy adults, *Stickybear Printer* can be used to design and print paper products. The large library of backgrounds, typefaces, borders, and illustrations make creating print masterpieces a snap!

Use the program's built-in formats to compose and create storybooks, folding toys, stand-up towns, greeting cards, and more. A friendly, versatile print dump program, *Stickybear Printer* supports the new Apple Scribe™ and Imagewriter™ II color printers as well as most popular printers, including the Apple Scribe and Imagewriter II with black ribbon, C. Itoh Prowriter, Epson FX 80, and Okidata 82, 92.

Look for our software in finer computer stores everywhere. Or call toll-free 800-852-5000.

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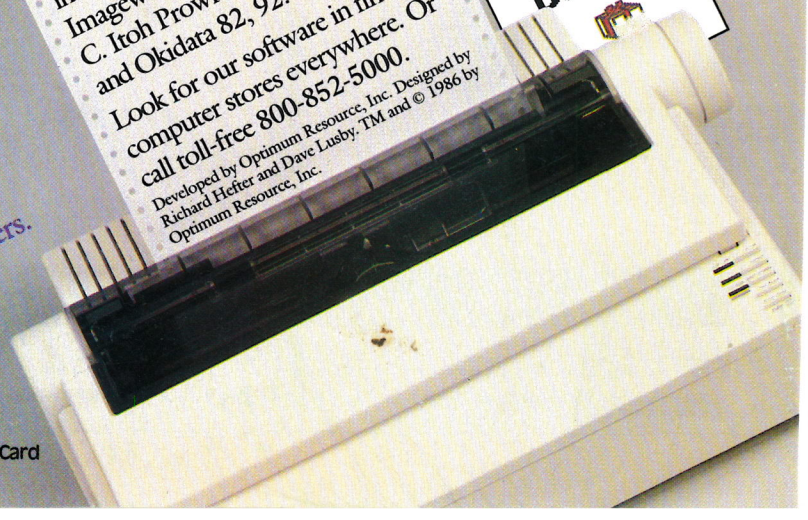

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